



## **An analysis of Puerto Rico's debt relief needs to restore debt sustainability**

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## **AN ANALYSIS OF PUERTO RICO'S DEBT RELIEF NEEDS TO RESTORE DEBT SUSTAINABILITY**

**BY PABLO GLUZMANN, MARTIN GUZMAN, AND JOSEPH E. STIGLITZ\***

Note: The analyses and computations included in this report were performed before Hurricane Maria hit Puerto Rico. The devastating effects of the hurricane have significant effects on the necessary debt relief for restoring Puerto Rico's public debt sustainability. We still do not have precise estimates of the economic costs imposed by Maria, but we expect to update our computations when more precise information on those costs becomes available.

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## EXECUTIVE SUMMARY

Puerto Rico's economy has been suffering a recession for more than a decade. The recession has led to a debt and economic crisis. The lack of opportunities has resulted in migration outflows that affect the lives of thousands of families and leave a higher burden on those who stay. Overall, the current macroeconomic dynamics is destabilizing the lives of nearly 3.5 million U.S. citizens in Puerto Rico. Reversing this dynamic requires appropriate macroeconomic and debt policies.

The collapse of economic activity has made the full payment of public debt unfeasible. Our study's main goal is to offer insights for designing a plan of action for resolving Puerto Rico's current debt crisis. The design of a restructuring proposal must note that the relationship between debt restructuring and fiscal policies exhibits bi-directional causality. On one hand, absent macroeconomic policies that expand the aggregate demand, Puerto Rico will not recover; and if the economy does not recover, Puerto Rico will not be able to pay its creditors without imposing severe damages on its nearly 3.5 million residents. On the opposite direction of causality, a larger debt reduction would imply that the territory would have more resources for expansionary macroeconomic policies, making the recovery more feasible and full repayment of the restructured debt more likely.

Our contribution is thus twofold. First, we examine the macroeconomic implications of Puerto Rico's Fiscal Plan that has been approved for fiscal years 2017-18 to 2026-27, as it is a crucial element for a computation of Puerto Rico's debt restructuring needs. Second, we perform a Debt Sustainability Analysis (DSA) that incorporates the expected macroeconomic dynamics implied by the Fiscal Plan in order to compute Puerto Rico's restructuring needs.

Our analysis of the fiscal plan detects two core flaws in its design:

(I) The plan is based on assumptions that are not sensible, thus it fails to appropriately recognize the magnitude of the destabilizing dynamics that it would create. Specifically:

- (i) The values of fiscal multipliers used for the GNP projections are unjustifiably optimistic: they assume that the fiscal contractions scheduled in the Fiscal Plan will be associated with output contractions that fall on the lower bound of the range of estimates provided by the empirical literature.

- (ii) The GNP projections ignore the feedback effects that the fall in economic activity would have on fiscal revenues, leading to an underestimation of the contractionary impact of the proposed fiscal policies.
- (iii) The plan's assumption that structural reforms that affect mostly the formation of aggregate supply will be the driver of economic recovery by as early as 2022 is inconsistent with sound macroeconomic theory, given that Puerto Rico's economy is in a demand-constrained regime, i.e. it is in a situation where there is underutilization of the factors of production of the economy. Any spending-reducing reform will more likely deepen the recession in the short-term.
- (iv) The plan is silent about how a deeper depression would likely intensify migratory outflows.

(II) The plan falls short on presenting a debt restructuring and sustainability analysis. Instead, it simply specifies what is the amount that must be repaid to creditors during the next decade, without being explicit about the longer-term obligations that the island will face and their sustainability. This has negative consequences in the short term, because the uncertainty about the island's long-term obligations will reduce the attractiveness of investing in the island in the present, thus harming the recovery prospects.

We also conduct a sensitivity analysis of the expected macroeconomic dynamics implied by Puerto Rico's Fiscal Plan. This allows us to construct more realistic scenarios of Puerto Rico's debt restructuring needs. The GNP projections of the Fiscal Plan lie on the upper-bound of our range of projections. And the entire range of projections predicts that real GNP will be lower by the end of the Fiscal Plan (year 2026) than in 2017. Thus, the implementation of the Fiscal Plan is projected to lead to a lost decade in terms of the evolution of economic activity.

Subsequently, we report the results of a Debt Sustainability Analysis (DSA) that incorporates our sensitivity analysis of the expected macroeconomic dynamics implied by Fiscal Plan. We report three main conclusions of this exercise.

(I) Assuming the fiscal plan will be respected, and absent a debt restructuring that reduces the current public debt stock, the territory would have to permanently sustain primary fiscal surpluses between approximately 3.5 and 7.4 percent of GNP, from 2027 onwards. Such a target is economically and politically infeasible. As a result, Puerto Rico's current debt position is unsustainable.

(II.A) When we maintain the assumptions of the Fiscal Plan, we obtain that the necessary reduction of Puerto Rico's debt to restore debt sustainability should include a full cancellation of the interest payments that are scheduled not to be repaid in the Fiscal Plan, plus a face value reduction that should lie roughly between 45 and 65 percent of the current debt stock of \$51.9 billions included in the Fiscal Plan.<sup>1</sup>

(II.B) However, the relevant universe of the public sector's debt obligations may go beyond the debts included in the Fiscal Plan, as the sustainability of the public sector's debt may also depend on the sustainability of a large part of debt issued by other public entities that is not included in the Fiscal Plan. When we compute the necessary relief assuming that the relevant stock of debt corresponds to the total debt of the public sector<sup>2</sup>, which increases the relevant stock to \$72.2 billions, we obtain that the necessary reduction includes full cancellation of unpaid interest plus a face value reduction of between 60 and 73 percent of this alternative relevant stock of public debt.

(III.A) Under a more comprehensive range of assumptions for fiscal multipliers that includes both the assumption of the Fiscal Plan and other more realistic scenarios, and dismissing the unjustifiably optimistic positive assumed effects of the structural reforms on GNP growth for the period 2017-2026, we conclude that if the fiscal plan is implemented, the territory would need full cancellation of interest payments not included in the Fiscal Plan plus a face value reduction that lies between roughly 50 and 80 percent to restore debt sustainability – and again, the necessary reduction is larger if we take \$72.2 billions instead of the just \$51.9 billions included in the Fiscal Plan as the relevant universe of debt obligations.

(III.B) These computations remain conservative, as we are not addressing how migration flows will be affected by the deeper depression that the fiscal plan is projected to generate, and we are also maintaining the Fiscal Plan's assumption that the territory will achieve a steady state annual nominal GNP growth rate of 2.6 percent without implementing any expansionary aggregate demand policies. Thus, the computation of a necessary debt reduction that includes full interest cancellation plus 50 to 80 percent of face value reduction must be considered as a lower-bound, i.e. as the most conservative estimate of the territory's relief needs.

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<sup>1</sup> In a letter sent by one of the authors of this report, Martin Guzman, to the Executive Director of the Financial Oversight and Management Board for Puerto Rico, Ms. Natalia Jaresko, the figures on the necessary debt reduction were adding the face value reduction and interest cancellation. This report separates the necessary face value reduction from interest cancellation.

<sup>2</sup> Net of Children's Trust's and HFA's debts, the reason for excluding the debts of those two entities being that their payment is not the responsibility of residents of Puerto Rico.

Finally, we note that these computations were performed before Hurricane Maria. The devastating effects of the hurricane have significant effects on the necessary debt relief for restoring sustainability. We still do not have precise estimates of the economic costs imposed by Maria, but we expect to update our computations when more precise information on those costs becomes available.

### *Conclusions and Further Considerations*

The future macroeconomic dynamics of the Puerto Rican economy will hinge upon the fiscal and debt restructuring plan that is adopted. We claim that the fiscal plan does not promote the economic recovery of Puerto Rico nor the sustainability of its debt position. Instead, the fiscal plan will almost certainly lead to an additional decade of depressed economic activity and will worsen the island's debt sustainability, perpetuating a crisis that all parties would like to end.

Restoring debt sustainability requires substantial debt reduction. A voluntary process of restructuring would be very unlikely to deliver the amount of relief that Puerto Rico needs. Recent experiences of public debt restructurings demonstrate that voluntary negotiations often lead to delays, insufficient relief for the country, and unequitable treatment for certain classes of creditors. The predictions from economic theory are aligned with this historical evidence. Thus, we contend that the government made a sensible move when it filed for bankruptcy under Title III of PROMESA on May 3, 2017. Otherwise, Puerto Rico would have been exposed to massive litigation that would have undermined the restructuring efforts and the road to economic recovery.

The restructuring proposal must take into account that decisions will be made under uncertainty. There are different layers of uncertainty, both in terms of the parameters that are used for the computations and in terms of the exogenous shocks to which Puerto Rico will be exposed over the coming decades. To deal with the underlying uncertainty, the restructuring process could be improved by the inclusion of GNP linked bonds that align debt payments with Puerto Rico's capacity to pay. By definition, these bonds improve the sustainability of the restructured debt, and they align the incentives of the debtor and the creditors such that the creditors would also benefit from a stronger recovery.

Our analysis does not study how the debt write-off will be distributed among bondholders but simply provides a perspective on the aggregate relief needs. The seniority structure will imply that not all bondholders will get the same discount, but the distribution of creditor losses will be determined by legal

considerations that go beyond the objective of this study. What this study offers is a computation of the aggregate relief needs to restore the sustainability of Puerto Rico's public debt.

Finally, we claim that the debt restructuring will not be a sufficient but just a necessary condition for economic recovery. Puerto Rico needs more than just the restoration of debt sustainability: it needs a new economic growth strategy that replaces the old one that has clearly failed. However, if debt is not appropriately restructured, no new growth strategy will be feasible. The CNE Growth Commission is doing complementary work to this study that devises a new growth strategy for Puerto Rico.



## 1. INTRODUCTION

Puerto Rico's economy has been suffering a recession for more than a decade. The recession has led to a debt and economic crisis. The lack of opportunities has resulted in migration outflows that affect the lives of thousands of families and leave a higher burden on those who stay. Overall, the current macroeconomic dynamics is destabilizing the lives of nearly 3.5 million U.S. citizens in Puerto Rico. Reverting this dynamic requires appropriate macroeconomic and debt policies.

The collapse of economic activity has made the full payment of public debt unfeasible. Our study's main goal is to offer insights for designing a plan of action for resolving Puerto Rico's current debt crisis. The design of a restructuring proposal must note that the relationship between debt restructuring and fiscal policies exhibits bi-directional causality. On one hand, absent macroeconomic policies that expand the aggregate demand, Puerto Rico will not recover; and if the economy does not recover, Puerto Rico will not be able to pay its creditors without imposing severe damages on its nearly 3.5 million residents. On the opposite direction of causality, a larger debt reduction would imply that the territory would have more resources for expansionary macroeconomic policies, making the recovery more feasible and full repayment of the restructured debt more likely.

Our contribution is thus twofold. First, we examine the macroeconomic implications of Puerto Rico's Fiscal Plan that has been approved for fiscal years 2017-18 to 2026-27, as it is a crucial element for a computation of Puerto Rico's debt restructuring needs. Second, we perform a Debt Sustainability Analysis (DSA) that incorporates the expected macroeconomic dynamics implied by the Fiscal Plan in order to compute the island's restructuring needs. Thus, the offers insights for designing a plan of action for resolving Puerto Rico's current crisis.

Besides this introduction, this work includes six other sections. Section 2 provides an overview of the current economic and fiscal situation. Section 3 introduces the conceptual framework that serves as the basis of our analysis of the Fiscal Plan and the computation of the debt restructuring needs. Section 4 examines the Fiscal Plan for the period 2017-2026. It first discusses its assumptions. We claim that some of its critical assumptions are unsound and analyze their implications. We identify a number of core flaws in its design and perform a sensitivity analysis, with respect to the assumptions, for the fiscal multipliers and the effects of the structural reforms. This analysis suggests that the fall in real GNP over the next decade is likely to be significantly larger than what the plan overoptimistically predicts.

Section 5 presents a computation of Puerto Rico's debt restructuring needs. We first demonstrate that the island's current debt position is by all means unsustainable. Assuming the fiscal plan will be respected, absent a debt restructuring, the territory would be forced to sustain primary fiscal surpluses between 3.5% and 7.4% of GNP from 2027 onwards, forever. But pursuing such a fiscal surplus would lead to a contraction that would make the collection of the necessary tax revenues to achieve it simply untenable, making the fiscal surplus unfeasible. Maintaining the assumptions of the fiscal plan, we obtain that the Puerto Rico's debt reduction, should include a full cancellation of the interest payments that are scheduled not to be repaid in the Fiscal Plan, plus a face value reduction that should lie roughly between 45 and 65 percent of the current debt stock if we take the \$51.9 billions of debt included as the Fiscal Plan as the relevant stock of public debt, or full cancellation of interest payments plus between 60 and 73 percent of face value reduction if we assume the relevant public debt stock is \$72.2 billions, which corresponds to the total debt of the public sector net of Children's Trust's and HFA's debts.<sup>3</sup> But as the Fiscal Plan's assumptions are flawed, those figures must be taken with caution. Under a wider set of assumptions for the fiscal multipliers and dismissing the positive assumed effects of the structural reforms on GNP growth for the period 2017-2026, we conclude that if the fiscal plan is implemented, the necessary debt reduction would be larger, including full interest cancellation plus roughly between 50 and 80 percent of the current debt stock – again, the necessary reduction is larger if we take \$72.2 billions rather than the \$51.9 billions included in the Fiscal Plan as the relevant amount of debt obligations. But even those computations are conservative, as we are not addressing how migration flows will be affected by the deeper depression that the fiscal plan is projected to generate, and more importantly, we are maintaining the fiscal plan's controversial assumption that the territory will somehow manage to achieve a steady state annual nominal GNP growth rate of 2.6% without having implemented any expansionary aggregate demand policies. Thus, that range must be considered as a lower-bound, i.e. as the most conservative estimate of the territory's relief needs.

The structure of seniority will imply that not all bondholders will get the same discount. Our analysis does not study how the debt write-off will be distributed among bondholders, but simply provides a perspective on the macroeconomic needs. The distribution of losses will be determined by legal considerations that go beyond the object of this study.

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<sup>3</sup> The reason for excluding the debts of those Children's Trust and HFO is that their payment will not be made with Puerto Rican people's funds.

We argue that in order to deal with the uncertainty that will underlie the implementation of the fiscal plan and the debt restructuring, the restructuring process could be improved with the inclusion of GNP linked bonds that align debt payments with Puerto Rico's capacity to pay. By definition, these bonds improve the sustainability of the restructured debt and align the incentives of the debtor and the creditors such that the creditors would also benefit from a stronger recovery. Section 6 explains why the restructuring is simply a necessary but not a sufficient condition for achieving a superior path of long-term growth, and it claims that the restructuring plan must be part of a broader economic plan that devises a new growth strategy for Puerto Rico. The capacity to implement a new growth strategy will depend on the effectiveness of the restructuring to restore the sustainability of Puerto Rico's debt position.

Finally, section 7 concludes. The section includes an analysis of the tensions that eventual differences between the Fiscal Plan projections and realizations will create in the short run, offers policy recommendations to deal with those contingencies, and summarizes our proposals for resolving Puerto Rico's social, economic, and debt crisis.

## **2. PUERTO RICO'S CURRENT ECONOMIC AND FISCAL SITUATION<sup>4</sup>**

Puerto Rico currently faces two distinct, yet related, crises. The first is an economic and social crisis, the product of the chronic stagnation of productive activity in the island over the last decade. The second is a fiscal crisis that arises out of the government's weak financial position.

In general, decades of fiscal and economic mismanagement have engendered an economy characterized by: (1) chronic primary deficits; (2) high debt-to-GNP ratios; (3) low employment levels in the formal economy; (4) a large informal economy, encompassing both legal and illegal activities; (5) significant government corruption and predatory rent-seeking behavior in both the public and private sectors; (6) substantial tax evasion; (7) a weak productive base; (8) low growth rates; and (9) high levels of private consumption and public indebtedness enabled by having access to a stronger currency than its economic fundamentals would warrant.<sup>5</sup>

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<sup>4</sup> This Chapter was written by Sergio M. Marxuach, Public Policy Director and General Counsel at the Center for a New Economy.

<sup>5</sup> Puerto Rico's currency is the US dollar, over which it has no control. If the island was managing its own exchange rate, its real exchange rate would surely be weaker.

## THE ECONOMIC SITUATION

Puerto Rico's economy is currently in a state of secular decline, both as a result of the failure to implement a new economic strategy and of the current destabilizing macroeconomic dynamics. Most significant economic indicators have been contracting or stagnant for the last decade.

*GNP* – The Puerto Rican economy, as measured by its Gross National Product ("GNP"), has been contracting in real terms for more than a decade. While nominal GNP increased at a modest compound growth annual rate of 1.6% between fiscal years 2007 and 2016, in real terms the island's economy shrunk by an aggregate of 14% during that period.

*Employment* – Since fiscal year 2008, total employment has declined by 17%, while payroll employment is estimated to have decreased by approximately 13%. Meanwhile, the employment to working-age population ratio has decreased from 41.4% in 2008 to 35.5% during fiscal year 2016. The picture with respect to labor force participation is quite similar, with the participation rate declining from 46.6% in 2008 to 40.2% in 2016.

*Population* – The prolonged economic contraction, the lack of employment opportunities and a significant decline in birth rates, has led to a significant decrease in the island's population. Puerto Rico's population has declined from approximately 3.8 million in 2000 to a little over 3.4 million in 2016, an aggregate reduction of 11% during that period. Between 2010 and 2016, the population's contraction rate exceeded 1% annually, and approached 2% in 2016. Over the same period, the population between 15 and 64 years old contracted from 2.47 to 2.28 million, a reduction of 7.7%.

## THE FISCAL SITUATION

For more than a decade, Puerto Rico has experienced significant General Fund budget deficits. These deficits, including the payment of a portion of the Commonwealth's debt service obligations, have been covered primarily with the net proceeds of bonds issued by the Puerto Rico Public Finance Corporation, the Puerto Rico Sales Tax Financing Authority ("COFINA") and Commonwealth general obligation bonds, with interim financing provided by the Government Development Bank and, in some cases, with extraordinary one-time revenue measures or expense adjustment measures.

In addition to running General Fund deficits, Puerto Rico has been running significant primary deficits, defined as non-interest revenues minus non-interest expenditures plus net interfund transfers, at least since 1998 (with a rather odd exception in 1999). Consistently running a primary deficit has real consequences over the long run, especially for a territory that lacks the traditional instruments of monetary policy.

Therefore, Puerto Rico, just like most governments facing this situation, ended up issuing large amounts of debt, at ever-higher costs, just to cover the payment of existing debts, a situation that eventually becomes unsustainable. This is the situation Puerto Rico is facing right now. Several debt obligations of the Commonwealth are currently in default and the island has thus lost all access to capital markets.

On May 3, 2017, the Board, recognizing the island's unsustainable debt position and acting on behalf of the Commonwealth, filed a petition for the adjustment of Puerto Rico's debts in the Federal Court for the District of Puerto Rico pursuant to Title III of PROMESA.

### 3. CONCEPTUAL FRAMEWORK

#### 3.A PUBLIC DEBT SUSTAINABILITY AND MACROECONOMIC DYNAMICS

A public debt sustainability analysis must be able to answer the two following questions:

Q1. Does the government have the means to repay its debt with high probability?

Q2. If it doesn't, what are the restructuring needs in order to restore debt sustainability?

Answering Q1 and Q2 requires a definition of the concept of debt sustainability. The economic definition of public debt sustainability refers to the capacity of the government to satisfy its intertemporal budget constraint (IBC) without resorting to a debt default. The IBC states that the present discounted value of primary fiscal surpluses has to be equal to the value of outstanding debt. Formally, in an infinite time setup we can describe the IBC as:

$$d_t^* = E_t \sum_{j=0}^{\infty} (1+r)^{-j} E_t s_{t+j} \quad (\text{IBC})$$

which holds if and only if

$$\lim_{j \rightarrow \infty} E_t \frac{1}{(1+r)^j} d_{t+j} = 0 \quad (\text{TC})$$

where the condition (TC) is known as the government's transversality condition,  $d_t^* = (1 + r)d_{t-1,t}$  denotes debt to output ratio at the start of period  $t$ ,  $s_t$  is the primary fiscal surplus to output ratio in period  $t$ , and  $1 + r = \frac{1+R}{1+g}$ , where  $R$  is the nominal interest rate and  $g$  is the growth rate of output (for simplicity we denote them as constant). In the context of Puerto Rico, we will use GNP as the measure of output.

More generally, the definition of debt sustainability may also refer to other economic or non-economic principles that are meant to ensure a continuing efficient functioning of debt markets and to respect human rights. For instance, debt could be considered unsustainable if full payment would entail the need to cut on essential public services.<sup>6</sup> Therefore, the satisfaction of the government's solvency condition is a necessary but not a sufficient condition for debt sustainability, as the territory's development needs have to be taken into account. Relatedly, defining debt sustainability also requires a definition of the relevant universe of creditors. Defining the universe of creditors in a public debt restructuring is different than in a corporate debt restructuring, as the creditors of a country need not be only the formal creditors but also the informal ones – as pensioners and workers.

## PUBLIC DEBT AND MACROECONOMIC DYNAMICS

The objects of each side of the (IBC) are not independent. The capacity to collect revenues depends on the level of economic activity. In turn, the level of economic activity depends on fiscal policies. But the space of feasible fiscal policies depends on the debt burden. Formally, the primary fiscal surpluses that enter the IBC must be “fixed-points” – consistent objects that respect the functional relationship between fiscal policies, economic activity, and fiscal revenues. The consideration of these endogenous feedback effects in a system in which fiscal outcomes, the level of economic activity, and the borrowing costs are endogenous variables is central in any analysis of debt sustainability, and missing it leads to flawed estimates of the implications of debt policies.

Puerto Rico's deep and long-lasting downturn has put the economy into a demand-constrained regime. Such a situation calls for the application of macroeconomic policies that expand the aggregate demand – a basic principle of macroeconomic theory.

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<sup>6</sup> The literature on the principles that should be respected in a restructuring process significantly grown over the last few years. For instance, see Blankenburg and Kozul-Wright (2016), Bohoslavsky and Goldmann (2016), Goldmann (2016), Guzman and Stiglitz (2016a, 2016b), Kolb (2006), Raffer (2016), and Li (2015).

Implementing expansionary macroeconomic policies requires the capacity for financing them. But a country that is in a demand-constrained regime and faces a debt burden that is unsustainable lacks the capacity for expansionary policies. Instead, the unsustainable debt position becomes a drag for economic growth. The logic is simple: when the debt position is perceived as unsustainable with larger probability, the cost of refinancing debt increases; this in turn increases the burden of interest payments, and decreases the available resources net of interest payments for financing public policies. Attempting to force full repayment under those conditions creates a destabilizing dynamic. The induced fiscal austerity decreases aggregate demand, which in the demand-constrained regime leads to a deeper recession, which in turn leads to a debt position perceived as even more unsustainable, and so on. Indeed, the idea that fiscal austerity could somehow restore solvency in an already depressed economy, in times in which the private sector is also contracting, without contemplating the possibility of deviation-amplifying contractionary spirals, is ill conceived and not aligned with sound macroeconomic theory or evidence.<sup>7</sup> The uncertainty created by an unresolved debt problem also deters new investment in the economy, such that the formation of supply is severely damaged in addition to the negative impact on aggregate demand.<sup>8 9</sup>

Thus, recovery of debt sustainability is a necessary condition for economic recovery, because there is no possibility of implementing the policies needed for macroeconomic recovery when debt is unsustainable. To recover debt sustainability, debt must be restructured. Even creditors as a group may benefit from a restructuring, because the expansionary effects that it allows increases the size of the pie that is distributed among the claimants.<sup>10</sup>

The theoretical literature also suggests various channels through which debt defaults are associated with output losses as the result of, for example, reputational damage and international trade

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<sup>7</sup> See, for example, Jayadev and Konczal (2010, 2015), Auerbach and Gorodnichenko (2012a, 2012b, 2012c, 2012d); Eggertsson and Krugman (2012); Herndon, Ash, and Polish (2014), Jorda and Taylor (2013); see also the commentaries by Krugman (2010, 2013, 2015) and Stiglitz (2010).

<sup>8</sup> The destabilizing dynamics at play in the context of a financial crisis has been thoroughly analyzed in the macroeconomics literature by seminal authors as Fisher (1933), Keynes (1936), Minsky (1977, 1992), Kindleberger (1978), Leijonhufvud (1981), Stiglitz and Heymann (2014), Koo (2003), and Eggertsson and Krugman (2014), among many others.

<sup>9</sup> In Puerto Rico, the sub-utilization of factors can rapidly turn migration, a phenomenon that would not be captured by measures of intensity of use of the available factors of production.

<sup>10</sup> This claim has been demonstrated by Krugman (1988), who demonstrates that the expected present discounted value of payments for creditors takes the shape of a Laffer curve as a function of the value of the debtor's total liabilities. The reason is that the probability of default, and thus the interest rate, is an increasing function of the debt burden. Sachs (1989) also emphasizes the potential welfare benefits of forgiving debt in a situation of debt overhang, in a model where both creditors and debtors can gain from a partial debt write-down, since an excessive debt stock and the prospect of large future debt repayments act as a tax on domestic investment and depress the present value of claims held by investors. Under those conditions, debt relief should be followed by a period of higher growth.

exclusion costs (e.g., Eaton and Gersovitz 1981; Bulow and Rogoff 1989; Cole and Kehoe 1998; Aguiar and Gopinath 2006; Arellano 2008). However, the empirical literature shows that the costs associated with those traditional mechanisms have not been significant in recent decades, but that the major costs have been those associated with the impact of defaults on domestic bondholders (Sandleris, 2016). The literature also suggests that defaults have dire political consequences for incumbent governments and finance ministers (Borensztein and Panizza, 2009).

Debt restructuring renegotiations under insufficient legal frameworks for dealing with collective action problems and inefficient delays that reduce output (Benjamin and Wright 2009; Pitchford and Wright 2012).

#### **RELATIONSHIPS BETWEEN FISCAL POLICIES, REVENUES, AND GNP GROWTH: THE FISCAL MULTIPLIERS**

The effects of the fiscal policies that are included in a macroeconomic plan will depend on the size of fiscal multipliers, i.e. the parameters that describe the impact of fiscal policies on the level of economic activity. Thus, any fiscal plan must aim at making realistic assessments on the values of the fiscal multipliers.

There are different types of multipliers. The 'spending to output multiplier' refers to the effect of changes in public spending on output. The 'tax rate to output multipliers' refer to the effects of changes of different tax rates on output; from the tax multipliers, we can infer the values of the 'revenues to output multipliers', which indicate how a variation in fiscal revenues will affect output. Finally, the 'spending to revenues multipliers' indicates how a change in public spending will affect tax revenues through the effects that it will have on the endogenous tax bases. Table 1 summarizes the different types of multipliers.



Table 1: Types of fiscal multipliers

Multiplier	Concept
Spending to output multiplier	How changes in public spending affect output
Tax rate to output multipliers	How changes in tax rates affect output
Revenues to output multiplier	How a variation in fiscal revenues affects output
Spending to revenues multiplier	How a change in public spending will affect tax revenues through the effect that it will have on the tax bases

There is a sizable empirical literature that estimates different types of fiscal multipliers for different regions or countries, in different stages of the cycle, and with different methodologies. Although to our knowledge there are no precise estimates for Puerto Rico, the literature offers valuable insights for assessing what assumptions are sensible at the moment of studying the consequences of a fiscal plan for the island. This section offers a brief review of the main findings from that literature.

*Fiscal multipliers are non-linear.* The evidence tells that fiscal multipliers are state-dependent. Auerbach and Gorodnichenko (2012b, 2012c), using regime-switching models, estimate the effects of fiscal policies over the business cycle and find that fiscal policy is considerably more effective in recessions than expansions. They provide estimates for multipliers for disaggregate spending variables for US regions. Military spending has the largest multiplier: estimates range from 3.69, with standard error of 0.83 (Auerbach and Gorodnichenko, 2012c) to 1.67, with standard error of 0.72 (Auerbach and Gorodnichenko, 2012b). The estimates for non-defense spending multipliers range from 1.34, with standard error of 0.31, to 1.09, with the same standard error. These values demonstrate the effect of \$1 of additional spending on output; for example, according to Auerbach and Gorodnichenko (2012c) an additional dollar of public spending in the non-defense sector increases output by \$1.34. In the expansion, the defense spending multiplier changes sign: it ranges from -1.03, with standard error of 0.25 (Auerbach

and Gorodnichenko, 2012c), to -0.43, with standard error of 0.24 (Auerbach and Gorodnichenko, 2012b). And the non-defense spending multiplier keeps the positive sign but the magnitudes are smaller: it ranges from 1.17, with standard error of 0.15 (Auerbach and Gorodnichenko, 2012c), to 1.03, with the same standard error (Auerbach and Gorodnichenko, 2012b).

Auerbach and Gorodnichenko (2012a) also estimate fiscal multipliers for OECD economies. The effects in recessions are stronger for this group of economies: Their point estimate is that an increase of government purchases of \$1 results in about \$3.50 of added GDP when the economy is weak, with a 90 percent confidence interval running from 0.6 to 6.3. On the other hand, in times of a strong economy, added government purchases reduce GDP, according to the point estimate. The confidence interval for that estimate includes moderate positive values. In all those estimates, the effects of fiscal policies are not necessarily concentrated in one year, but can be accumulated over time.

The IMF has also recognized the importance of considering the non-linear nature of multipliers (Blanchard and Leigh, 2013). This recognition received special attention as the calls for a reconsideration of the methodology for assessing debt sustainability and the assumptions on multipliers had intensified after the dramatic consequences that the underestimation of the impact of fiscal austerity had for Greece, and also for other European economies in distress (see Guzman and Heymann, 2015).

Another estimate is provided by Nakamura and Steinsson (2014), who using historical data on military procurement to estimate the effects of government spending, obtain a so-called “open economy relative multiplier” of approximately 1.5 – the “open economy relative multiplier” estimates the effects on output that an increase in government spending in one region of the union relative to another, and differs from the “closed economy aggregate multiplier” that is estimated using aggregate US data.

More recently, Chodorow-Reich (2017), based on an analysis of the American Recovery Reinvestment Act and of a survey of empirical studies, suggests that his “preferred” point estimate of the cross-sectional fiscal spending to output multiplier lies around 1.8.

*There are negative endogenous feedback effects from fiscal contractions.* The design of a fiscal plan has to take into account that changes in public spending will not only affect the level of economic activity, but also that the changes in economic activity will affect fiscal revenues. The endogenous feedback effects are central for estimating the impact of a fiscal contraction on the sustainability of the debt position and

on the level of economic activity. Auerbach and Gorodnichenko (2012b, 2012c) also offer evidence on the impulse-responses regarding the effects of an increase in public spending on tax revenues. For non-defense spending, the tax revenues response to an increase in \$1 ranges from \$0 to \$1.<sup>11</sup>

*Fiscal multipliers depend on the exchange rate regime.* Consistent with the predictions from economic theory, the empirical literature finds that they are larger in economies operating under predetermined exchange rates than under flexible exchange rates (Ilzetki, Mendoza, and Végh, 2012).

*There is uncertainty about the values of multipliers in a particular economy at a particular time.* This is a simple corollary of the multipliers state-dependence. Certainly, there is no precise knowledge about the correct distributions for the values of multipliers for Puerto Rico. Extrapolating values found for US regions or other economies may be of help, but an analysis for Puerto Rico must take into account that the territory is currently in a deep recession, hence multipliers are likely to be larger than what is obtained for US regions in more “normal” recessions.

There are other elements from economic theory that must be taken into account even if the evidence to assess their quantitative relevance for Puerto Rico’s case is scarce. In Puerto Rico, fiscal policies will also have effects on the size of the population that will in turn affect fiscal revenues.

Ultimately, the uncertainty about the values of the multipliers has practical implications for an analysis of debt sustainability and for the study of the consequences of a fiscal plan. It makes sensitivity analysis with respect to the baseline assumptions an especially necessary part of the exercise. Our analysis will include a sensitivity analysis that refers to the ranges of estimates that we reported in this section.

## THE STOCHASTIC NATURE OF THE DSA

Given that any analysis is made under uncertainty, the implication is that the assessment of debt sustainability must be stochastic (see IMF, 2013; Celasun, Debrun, and Ostry, 2006; Consiglio and Zenios,

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<sup>11</sup> See Appendix Figure A.3 in Auerbach and Gorodnichenko (2012c) and Figure A.3 in Auerbach and Gorodnichenko (2012b).

2015, 2017; Guzman and Heymann, 2015; Guzman and Lombardi, 2017). There may be multiple states of nature, and each state of nature will have a different associated IBC.

### **3.B EMPIRICAL EVIDENCE ON DEBT REDUCTION AND MACROECONOMIC PERFORMANCE**

The hypothesis that a deeper debt restructuring is associated with a better post-restructuring economic performance is supported by the evidence. Reinhart and Trebesch (2016) examine the economic performance of debtor countries during and after sovereign debt relief operations, for samples that cover the periods 1920-1939 for defaults on official (government to government) debt and 1978-2010 for emerging markets defaults with private creditors. They find evidence that is clearly consistent with the notion that debt relief has beneficial economic effects for debtor countries. Specifically, they find that per capita GDP increases 11 percent for emerging markets and 20 percent for advanced economies during the five years following a restructuring that results in exiting from the state of default. They also find a strong increase in average ratings for emerging markets – a result predicted by economic theory, as the market perceptions of debt sustainability should improve if the debt restructuring is effective for resolving the debt crisis. Besides, debt levels decline strongly following the exit of crises. Within five years, total government debt/GDP falls by 27 percentage points across emerging market episodes and by 22 percentage points in the sample of defaults with official creditors.

However, they find that not every type of restructuring is associated with improvements in economic performance and ratings: the effects are significant only in deals that involve face value reductions. Reprofilings deals, such as operations with maturity extensions and interest reductions, were not associated with improvements in economic performance.

Recent commentaries and research have made the mistake of looking at what has been the average in past restructurings as a guide for future debt policies (Edwards 2015a, 2015b). But what has been the norm in recent practice should instead be taken as representative of what is unacceptable. The amount of relief that distressed countries have obtained has generally been insufficient to resolve debt crises. This has been recognized by the IMF: “Any assessment of debt sustainability needs to be underpinned by realistic—rather than heroic—assumptions regarding future growth prospects, taking into account the reality that economies have often taken longer to recover from crises than was originally expected.” (Hagan, Obstfeld, and Thomsen, 2017).

Indeed, restructurings are coming in the form of “too little and too late” (cf. Guzman, Ocampo, and Stiglitz, 2016). From 1970 to 2010, between 49.9% and 60% of sovereign debt restructurings with private creditors were followed by another restructuring or default within 3 to 7 years, respectively (Guzman and Lombardi, 2017, based on data from Cruces and Trebesch, 2013).

## DESCRIPTION OF CASE STUDIES

Among the successful cases, two stand out – at least in terms of their magnitude and the attention they have received in the literature. One of them is the case of West Germany following World War II. West Germany obtained significant debt relief through the London Debt Agreement (LDA). The case is studied by Galofré-Vilà et al. (2016), who conclude that West Germany’s spectacular recovery would have not been possible without the LDA. The significant debt write-down released resources for fiscal policies that allowed the pursuing of the public policies that the recovery required. Absent such a relief, West Germany would have been forced to obtain sizable fiscal surpluses that would not only have undermined the recovery, but would also have fostered political instability, potentially renewed geopolitical conflict, and ultimately be self-defeating.

The other case was Argentina’s debt restructuring following the default of 2001 – the largest recorded sovereign default in history at the time. The country followed a strategy that resulted in significant debt relief (see Basualdo et al. (2015); Guzman (2016); Chodos (2016); and Cruces and Samples (2016) for details), which created space for fiscal policies that played a crucial role in the fast and large recovery that the country experienced following the default.<sup>12</sup> However, the country also got immersed in a complex legal dispute with holdout bondholders – bondholders who decide not to cooperate in restructuring negotiations even when a large majority accepts the proposal of the debtor – including the so-called vulture funds who bought debt at a low fraction of its face value when it was already in default, sued the country in US courts seeking full payment and won, making billions for themselves at

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<sup>12</sup> In a context of favorable international conditions and under the implementation of a policy of competitive and effectively multiple real exchange rates, GDP grew more than 8 percent on average from 2003 until the eruption of the global financial crisis in 2008 (see also Damill, Frenkel, and Rapetti (2015) for a more comprehensive description of the post-default dynamics, and Guzman, Ocampo, and Stiglitz (2017) for a description of the rationale of those policies and their importance in the Argentine post-default recovery). These conditions are markedly different than the ones Puerto Rico will face after its debt restructuring.

the expense of the Argentinian people. The case is also telling of the complexities of resolving debt crisis under severe gaps in the legal frameworks.

Among the recent unsuccessful cases, Greece stands out. The case is extensively analyzed by Varoufakis (2016). The management of Greece's ongoing debt crisis is an example of too little and too late. After a few years of recession and of an unsustainable debt position, the country restructured its debt in 2012. But the restructuring was not effective to restore debt sustainability. It came with conditions of fiscal austerity imposed by the Troika that undermined the possibility of escaping the recession. The draconian demands have continued since then. The Troika later imposed an absurd program for reducing Greece's public debt to GDP ratio that included a target of primary surplus of 3.5 percent of GDP for 2015, and 4.5 percent of GDP from 2015 onwards, forever. The country continues to struggle, and throughout this period, opportunities have vanished for many Greeks. The unemployment rate was 7 percent in 2008 and skyrocketed since then, growing higher than 25 percent; it was 23 percent in 2016. Youth unemployment statistics are even more alarming. The youth unemployment rate peaked at 60 percent in 2013, then declined to 47 percent at the time of this study after many migrated or stopped looking for jobs. The failure of Greek's restructuring process is a case that we would do well not to repeat.

## **THE IMPORTANCE OF LEGAL FRAMEWORKS**

The poor outcomes in sovereign debt restructurings are related to the lack of proper legal frameworks for resolving the disputes that arise when debts cannot be repaid in full. There is no equivalent of an international bankruptcy court for sovereigns, or not even something remotely close to it (Guzman and Stiglitz, 2016a; Guzman and Stiglitz, 2016b; Li, 2015; Gelpern, 2016; Goldmann, 2016, Bohoslavsky and Goldmann, 2016; Raffer, 2016; Howse, 2016; Ocampo, 2016; Brooks et al., 2015; Gelpern, Heller, and Setser, 2016). Restructurings often involve protracted negotiations with multiple creditors with different interests and different capacities. In that context, there is a serious risk of holdout behavior. Litigation related to countries' debt restructuring disputes has been increasing over the last two decades (see Schumacher, Trebesch, and Enderlein, 2014). Holdouts pose the risk of making the finalization of a restructuring process impossible to achieve, thus undermining the prospect for economic recovery of the distressed debtor and also creating vast inequities between the treatment of different creditors.

But Puerto Rico's restructuring will occur in a different context. Unlike the case of sovereigns, Puerto Rico will restructure under the framework that was established with the enactment of PROMESA. This could be a valuable advantage.

But Puerto Rico will face a constraint that sovereign debtors generally do not face: the island does not have the authority to make its own decisions. The people of Puerto Rico thus have to rely on the good intentions of an appointed Fiscal Board which must ultimately approve any restructuring plan presented. If the government presents a plan that is aligned with the development goals of the territory and the Board supports it, PROMESA will help. But if the Board demands a plan that intends to squeeze as much as possible to satisfy creditor demands at the expense of the Puerto Rican people, PROMESA will hurt.

### 3.C METHODOLOGY FOR COMPUTING THE APPROPRIATE SIZE OF RELIEF IN THE DEBT RESTRUCTURING PROCESS

The computation of the appropriate debt relief must identify what is the maximum amount of debt that can be repaid in each state subject to the satisfaction of other constraints defined in the restructuring process, as for instance a minimum acceptable growth rate of output in steady state. Section 5 describes in detail how we perform the computations of the appropriate debt relief for Puerto Rico and the assumptions on which they are based.

This restructuring plan must come with a macroeconomic plan for the short-term recovery, as well as with a development strategy for improving long-term prospects.

Our empirical application consists of the following functional relationships:

The growth rate of real GNP,  $g_t^y$ , is defined as

$$g_t^y = g_t^b + g_t^d + g_t^s$$

where  $g^y$  is the real GNP growth,  $g_t^b$  is the baseline real GNP growth rate,  $g_t^d$  is the growth rate of real GNP that comes from fiscal policy measures, and  $g_t^s$  is the growth rate in real GNP that comes from structural reforms, in all cases between years  $t - 1$  and  $t$ . The growth rate of real GNP that comes from fiscal policy measures is given by

$$g_t^d = \frac{\Delta RGNP_t^d}{RGNP_{t-1}}$$

where  $RGNP_t$  is the real GNP in year  $t$ , and

$$\Delta RGNP_t^d = \alpha_{Y,G} \Delta G_t + \alpha_{Y,T} \Delta T_t^C + \alpha_{Y,T} \Delta T_t$$

where  $\alpha_{Y,G}$  is the public spending to real GNP multiplier and  $\alpha_{Y,T;t}$  is the fiscal revenues to real GNP multiplier.

The component  $\Delta T_t^C$  denotes the necessary change in tax revenues to compensate the initial variation due to the change in public spending in year  $t$ :

$$\Delta T_t^C = -\alpha_{T,G;t} \Delta G_t$$

where  $\alpha_{T,G;t}$  is the public spending to fiscal revenues multiplier that denotes the endogenous feedback effect that a contraction of public spending creates on fiscal revenues through the fall in economic activity.<sup>13</sup>

Informed by the literature (see section 3.A above), we project the real and nominal GNP for each possible combination of the following parameters:  $\alpha_{Y,G} = \{1, 1.34, 1.5, 2, 2.5, 3, 3.5\}$ ,  $\alpha_{Y,T} = \{0, 0.5, 1, 1.34\}$ , and  $\varepsilon_{T,G} = \{0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7\}$  where  $\varepsilon_{T,G}$  is the elasticity of fiscal revenues to public spending,

$$\varepsilon_{T,G} = -\alpha_{T,G;t} \frac{G_t}{T_t}$$

We are making a conservative assumption for the tax revenues to real GNP multiplier, under the premise that part of the increases in tax revenues will fall on agents with low marginal propensities to consume. Our projections would be more pessimistic if we chose the same range for  $\alpha_{Y,T}$  as for  $\alpha_{Y,G}$ .<sup>14</sup>

The nominal GNP growth rate is denoted by  $g^Y$ , where

$$g_t^Y = g_t^Y + \pi_t + g_t^Y \pi_t$$

<sup>13</sup> The latter multiplier includes the time sub-index  $t$ , because we assume constant values for the elasticities of fiscal revenues to public spending, hence the multiplier will vary over time with the variations in the fiscal revenues to public spending ratio.

<sup>14</sup> Not all the measures on the fiscal revenues side will lead to a reduction of Puerto Ricans' spending. For instance, while the Fiscal Plan plans to replace Act 154 by taxes that would achieve the current revenues over the next decade, if Act 154 was replaced with a tax that is paid by multinationals there would be no associated depressing effect on Puerto Rico's economy. Our conservative range of assumptions for the multiplier of tax revenues on output accounts for the possibility of a less depressing effect of revenues measures relative to public spending measures. It must be noted, however, that there is uncertainty about Act 154 being replaced by a scheme that has no cost on Puerto Ricans. This will depend on Federal policies that are beyond Puerto Rico's reach, which adds a layer of uncertainty to the projections of the effects of the Fiscal Plan. This uncertainty is indeed a matter of major concern. Makoff and Setser (2017) explain that "how Puerto Rico will [Act 154 will eventually be replaced by a set of taxes that maintain current levels of revenue over the next 10 years] is a great mystery: nobody has explained how Puerto Rico will continue to collect the same amount of revenue from the tax-allergic multinational corporations if federal forbearance on credibility lapses." (p.23).



and where  $\pi_t$  is the rate of inflation between years  $t - 1$  and  $t$ .

The real GNP in period  $t$  is given by

$$RGNP_t = RGNP_{t-1}(1 + g_t^y)$$

and the nominal GNP in period  $t$  is given by

$$NGNP_t = NGNP_{t-1}(1 + g_t^Y)$$

Our choice of parameters for the multipliers  $\alpha_{Y,G}$ ,  $\alpha_{Y,T}$ , and the elasticity  $\varepsilon_{T,G}$  results in 192 combinations of parameters that can be defined as “scenarios”. We project real and nominal GNP for each of those 192 scenarios.

#### 4. AN ANALYSIS OF THE FISCAL PLAN 2017-2026<sup>15</sup>

In this section, we examine the macroeconomic implications of Puerto Rico’s Fiscal Plan that has been approved for fiscal years 2017-18 to 2026-27, as it is a crucial element for a computation of Puerto Rico’s debt restructuring needs. The Fiscal Plan presented by the Government of Puerto Rico was approved by the Oversight Board on March 13, 2017.

The plan includes a detailed path of policies, including spending and tax policies as well as structural reforms. It offers a projection of the effects of those policies on Puerto Rico’s GNP for the ten-year period under a set of assumptions regarding the macroeconomic effects of fiscal policies, the effects of the structural reforms, the migration flows, the growth rate of GNP in absence of changes in fiscal policy, and the inflation rate.

On the demand side, the program is characterized by fiscal contractions over the entire decade but mainly concentrated in years 2018 and 2019. Regarding the structural reforms, the plan features four packages that are classified as (i) improve the ease of business activity, (ii) improve capital efficiency, (iii) energy reform, and (iv) promoting economic development. The concrete measures include (textually reproduced from the approved Fiscal Plan, p. 23):

- Institute public policy measures aimed to attract new businesses, create new employment opportunities, and foster private sector employment growth to increase labor demand.

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<sup>15</sup> For a non-technical summary of the findings presented in this section, see Guzman and Stiglitz (2017).

- Change welfare and labor incentives to encourage greater sector participation, thus increasing labor supply.
- Centralize, streamline, and modernize and expedite permitting processes; increase business friendly environmental and economic growth.
- Lower marginal tax rates and broaden the tax base; simplify and optimize the existing tax code to achieve gains in efficiency, ease of doing business and reducing tax evasion.
- Reduce unnecessary regulatory burdens to reduce the drag of government on the private sector.
- Augmenting competitiveness by investing in critical infrastructure and quality of public services in roads, ports, telecommunications, water and waste, knowledge services, and other strategically important sectors.<sup>16</sup>
- Leverage key public assets through long-term concessions to optimize quality of public infrastructure, services to public and sustainable operations and maintenance.
- Implement management system to boost development of critical projects through expedited processes.
- Leverage and facilitate expedited private sector investments in modern, cost- efficient, and environmentally compliant energy infrastructure; reform PREPA operations and services to clients; and allow for greater competition in energy generation.
- Promote productivity growth, attract FDI & incentivize investments in technology through collaboration with the private sector.
- Externalize the overseeing of marketing efforts & continuity under a single brand and as a unified front representing all of Puerto Rico's tourism components.

Table 2, reproduced from the Fiscal Plan (p.10), summarizes the fiscal measures and the projections for the growth rate of nominal GNP.

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<sup>16</sup> Public investments do not only affect supply formation but also have demand multiplier effects.

Table 2

(\$MM)											
Fiscal year ending June 30 (\$ in millions)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	'17 - '26 total
PR Nominal GNP Growth	(2.2%)	(2.8%)	(2.4%)	(0.5%)	(0.4%)	0.3%	1.0%	1.6%	2.1%	2.6%	
Revenues before Measures <sup>1</sup>	\$18,952	\$17,511	\$16,407	\$16,434	\$16,494	\$16,590	\$16,746	\$16,953	\$17,204	\$17,509	\$170,799
Noninterest Exp. before Measures <sup>1</sup>	(\$17,872)	(\$18,981)	(\$19,233)	(\$19,512)	(\$19,950)	(\$20,477)	(\$20,884)	(\$21,310)	(\$21,973)	(\$22,316)	(\$202,507)
Cash flows pre-Measures	\$1,080	(\$1,470)	(\$2,826)	(\$3,077)	(\$3,456)	(\$3,886)	(\$4,139)	(\$4,357)	(\$4,769)	(\$4,807)	(\$31,708)
<b>Measures</b>											
Revenue measures	--	924	1,381	1,384	1,531	1,633	1,740	1,752	1,766	1,785	13,897.1
Expense measures	--	951	2,012	2,415	2,983	3,156	3,255	3,357	3,724	3,830	25,683.3
Net impact of measures	--	1,875	3,393	3,799	4,515	4,789	4,995	5,108	5,491	5,615	39,580
Cash flows post-Measures, before Debt Service	\$1,080	\$404	\$567	\$722	\$1,059	\$903	\$857	\$751	\$722	\$808	\$7,873

Source: Fiscal Plan 2017-2026

The plan assumes a constant annual population growth rate of -0.2% for the entire period and an evolution of the inflation rate as described in Table 3.

Table 3

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
PR Annual Inflation Rate (%)	-0.2	1.2	1.0	1.0	1.1	1.3	1.5	1.5	1.6	1.6

Source: Fiscal Plan 2017-2026

As publicly reported, the plan assumes that the multiplier associated with fiscal contractions will be 1.34, which means that every dollar of contraction in the primary surplus will be associated with a fall in GNP of 1.34 dollars. The Fiscal Plan assumes baseline real GNP growth rates for the decade as described in Table 4.<sup>17</sup>

<sup>17</sup> These assumptions were made by the Fiscal Board and accepted by Puerto Rico's government.

Table 4

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Baseline Real GNP Growth (%)	-2.4	-1.31	-1.39	-1.44	-1.47	-1.49	-1.50	-1.51	-1.52	-1.53

Source: Fiscal Plan 2017-2026

The plan also assumes that the effects of the structural reforms will kick in by 2022 and will make a contribution to real GNP growth as described in Table 5.

Table 5

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Impact of structural reforms on real GNP growth (%)	0	0	0	0	0	0.5	1	1.5	2	2.5

Source: Fiscal Plan 2017-2026

## CRITIQUES

Our analysis of the fiscal plan detects two core flaws in its design:

- (I) The plan is based on assumptions that are not sensible, thus it fails to appropriately recognize the magnitude of the destabilizing dynamics that it would create.
- (II) The plan falls short on presenting a debt restructuring and sustainability analysis. Specifically, instead it simply specifies what is the amount that must be repaid to creditors during the next decade, without being explicit about the longer-term obligations that the island will face and their sustainability.

We discuss each of these in turn. Specifically:

- (i) The values of fiscal multipliers used for the GNP projections are unjustifiably optimistic: they assume that the fiscal contractions scheduled in the Fiscal Plan will be associated with output contractions that fall on the lower bound of the range of estimates provided by the empirical literature.

- (ii) The GNP projections ignore the feedback effects that the fall in economic activity would have on fiscal revenues, leading to an underestimation of the contractionary impact of the proposed fiscal policies.
- (iii) The plan's assumption that structural reforms that affect mostly the formation of aggregate supply will be the driver of economic recovery by as early as 2022 is inconsistent with sound macroeconomic theory, given that Puerto Rico's economy is in a demand-constrained regime, i.e. it is in a situation where there is underutilization of the factors of production of the economy. Any spending-reducing reform will more likely deepen the recession in the short-term.
- (iv) The plan is silent about how a deeper depression would likely intensify migratory outflows.

1. The values of fiscal multipliers used for the GNP projections are overoptimistic.

The value for the multiplier associated with the fiscal contraction of 1.34 is close to the lower-bound of the estimates corresponding to times of recession, as described in the review of the literature in section 3. That value corresponds to estimates for US regions in recessions,<sup>18</sup> but Puerto Rico is suffering a depression that is deeper than a "normal" recession. And even if the assumption is considered sensible, a robust plan should consider the consequences of deviations from it. It is not only the point estimate what matters, but also the distribution.

2. The endogenous feedback effects that the fall in economic activity would have on fiscal revenues are not taken into account.

While the assumption on the fiscal multiplier cannot be classified as a wrong assumption – but simply as an overoptimistic one, ignoring the effects that the fall in economic activity would have on tax revenues is a plain mistake. Implicitly, the projections assume that the elasticity of public spending on tax revenues is zero – or else the multiplier associated with the fiscal contraction would have to be lower, but this would contradict what has been said in public. This is not aligned neither with economic theory nor with the empirical evidence described in section 3.

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<sup>18</sup> The definition of a recession comes from a calibration that is consistent with the duration of recessions according to the NBER business cycle dates since 1946.

3. The plan assumes that the territory will begin to experience a recovery starting in 2022 entirely because of structural reforms that mostly affect the supply side. This assumption goes against sound macroeconomic theory, because Puerto Rico's economy is a demand-constrained regime.

In a supply-constrained regime, structural reforms that remove obstacles to supply formation will likely have expansionary effects. But Puerto Rico's economy is in a demand-constrained regime. Thus, the assumption that supply-side reforms will be the driver of economic recovery is not well-founded. On the contrary, any spending-reducing reform as cuts in pensions will more likely deepen the recession in the short-term.

In summary, the entire reasoning of the fiscal plan for how Puerto Rico will recover relies on an assumption that is not aligned with sound economic theory. Puerto Rico will not manage to recover if it does not implement policies that push aggregate demand while the economy is in a demand-constrained regime.

4. The assumption on migration flows assume that migration pressures will not intensify with the projected contraction in economic activity.

Puerto Rico's population has declined from approximately 3.8 million in 2000 to a little more than 3.4 million in 2016. Between 2010 and 2016, the annual rate of population contraction exceeded 1%, and reached 1.8% in 2016. A deeper recession – as anticipated by the Board's plan – will further decrease opportunities in the island, fueling more migration to the mainland. And yet the plan assumes that the migration flows will taper off, with the population declining by only 0.2% per year over the 2017-2026 period. This is an unrealistic assumption.<sup>19</sup>

An intensification of migration outflows would accelerate the fall in fiscal revenues. Then, to achieve the revenue targets stated in the Fiscal Plan, the adjustments would need to be larger – but that would trigger

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<sup>19</sup> Makoff and Setser (2017) provide a detailed analysis of Puerto Rico's migration dynamics in its recent history and argue that the Fiscal Plan's assumptions on migration over the next decade are off. In their words: "Something is off here. How does the economy drop by 12 percent over 10 years and the population by only two percent? How does the rate of net migration improve from its current run rate of -2 percent a year to only -0.2 percent a year at the same time that the island is being hit by a significant cut in jobs and services? Absent a miraculous shift in household sentiment, Puerto Rico's population will certainly fall by more than the plan projects." (Makoff and Setser (2017), p.16.). They also observe that the Puerto Rico Institute of Statistics reported that the new Census Bureau outmigration projection for the next 10 years is 1.4 percent annually.

further contractions in economic activity and would increase the per capita burden for those remaining in the island, leading to a destabilizing dynamic that the Fiscal Plan fails to recognize.

5. The plan does not present a proposal for debt restructuring.

The plan simply states what is the amount that must be repaid to creditors during the next decade, but it falls short on the specifics of a restructuring plan as, for instance, on the amount of relief that the territory should obtain to restore debt sustainability. This is a mistake, because the possibilities that the territory will face in terms of fiscal policies are contingent on the restructuring it achieves. The plan should first specify a restructuring proposal, and craft a fiscal plan that is consistent with that restructuring proposal.

There is a sixth issue that deserves attention. The annual growth rate of nominal and real GNP are assumed to reach 2.6% and 1% respectively in 2026. It is not specified whether these assumptions correspond to a steady state.<sup>20</sup>

Ultimately, the exercise of projecting the effects of public policies must take into account that there is uncertainty about the values that the relevant parameters and shocks will take. The sensitivity analysis, where changes in the assumptions are analyzed, must be part of the projections analysis. We next engage into such an exercise.

## PROJECTIONS: SENSITIVITY ANALYSIS

In order to address the limitations of the Fiscal Plan forecasts, we conduct a sensitivity analysis of the expected macroeconomic dynamics implied by Puerto Rico's Fiscal Plan. This allows us to construct more realistic scenarios of Puerto Rico's debt restructuring needs. We project the trajectories under

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<sup>20</sup> An additional concern, not analyzed in this study but in Makoff and Setser (2017), is that the baseline trend of Puerto Rico's economy may be worse than projected by the Fiscal Plan. They point out that while the Fiscal Plan takes a continued fall of the economy on its historic trend (about 1.5 percent a year since 2005) as the baseline scenario, this is a controversial assumption, "because the territory's historic downward trajectory likely would have been much worse if it were not for the billions of dollars injected into the economy through emergency federal transfers (Obamacare, the American Recovery Act stimulus and the backdoor transfer provided by the federal tax treatment of Act 154), the commonwealth's aggressive debt financings (primarily general obligation, "GO," and sales tax backed, "COFINA," bonds), and the depletion of Puerto Rico's public pension plan assets to pay benefits." (p.16).

alternative assumptions for fiscal multipliers described in Section 3X above, maintaining the same assumptions of the Fiscal Plan for the trajectory of baseline real GNP growth and the annual inflation rates until 2026. We maintain those assumptions because our initial goal is to assess how the GNP projections react to changes in the values of the fiscal multipliers. We assume that the component of the fiscal primary balance that corresponds to the line “Measures” in Table 2 is the unanticipated component of the fiscal policy, to which the multipliers apply – the Fiscal Plan assumes the same.

Our choice of parameters for the multipliers  $\alpha_{Y,G}$ ,  $\alpha_{Y,T}$ , and the elasticity  $\varepsilon_{T,G}$  results in 192 combinations of parameters that can be defined as “scenarios”. We project real and nominal GNP for each of those 192 scenarios. Figures 1 and 2 show the range of our projections maintaining the Fiscal Plan’s assumptions on the effects of structural reforms on GNP and the Fiscal Plan’s projections. Figures 3 and 4 repeat the comparison under the assumption that the Fiscal Plan’s structural reforms have no effect on GNP.

Figures 1 and 2 show the range of our projections under the maintaining the Fiscal Plan’s assumptions on the effects of structural reforms on GNP and the Fiscal Plan’s projections. Figures 3 and 4 repeat the comparison under the assumption that the Fiscal Plan’s structural reforms have no effect on GNP.



Figure 1

(assuming the Fiscal Plan's assumption on structural reforms hold)

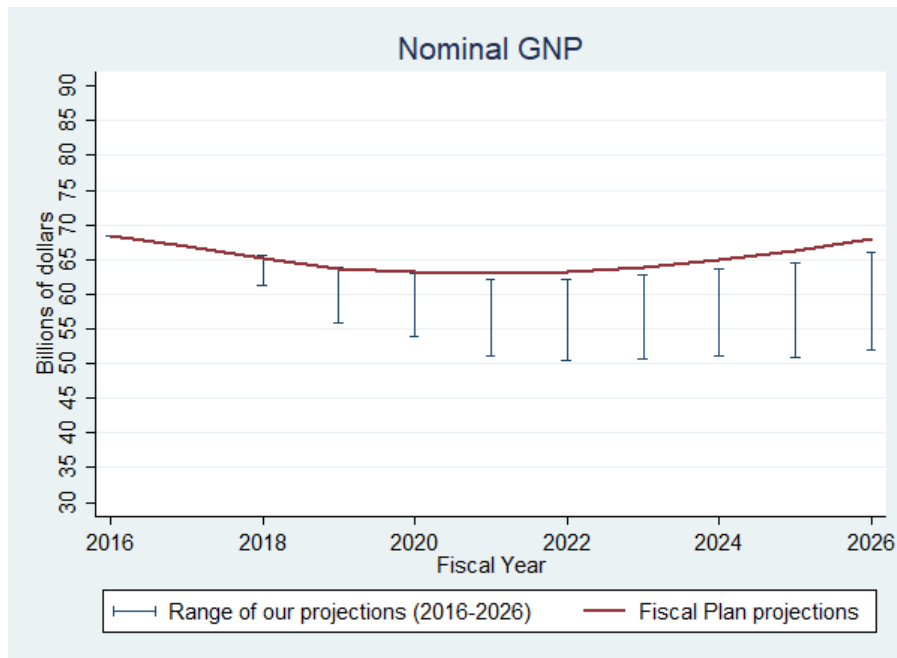


Figure 2

(assuming the Fiscal Plan's assumption on structural reforms hold)

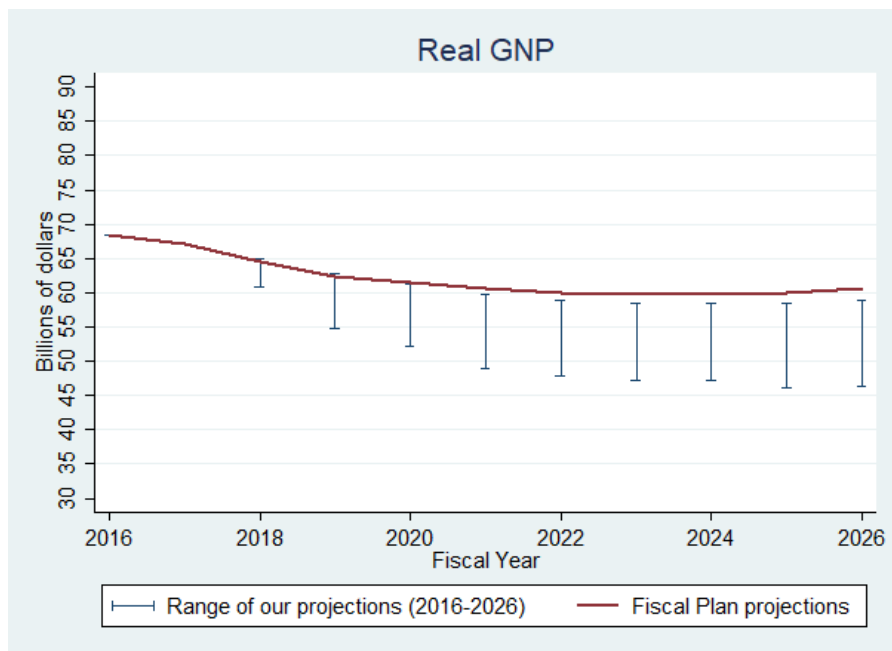


Figure 3

(assuming structural reforms have no effect on GNP)

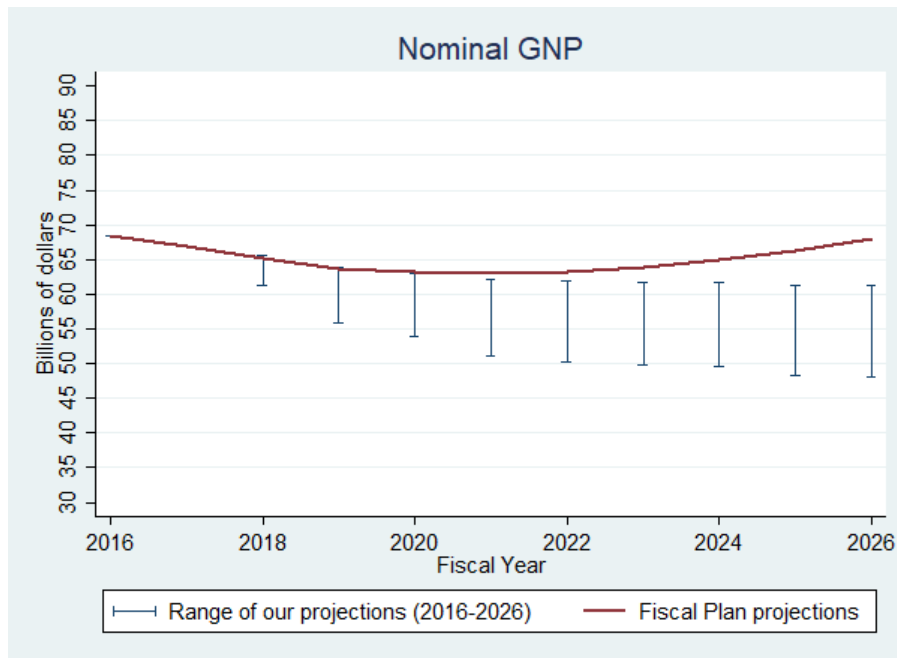
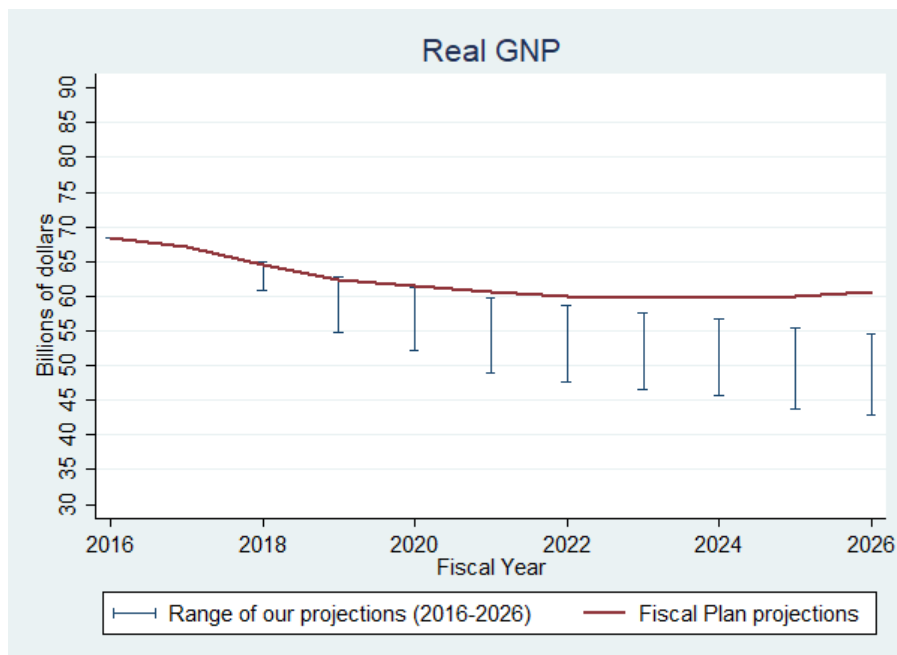


Figure 4

(assuming structural reforms have no effect on GNP)



Our projections strongly suggest that the Fiscal Plan's projections are overoptimistic. They lie on the most optimistic bound within the range of assumptions on the values of multipliers that are aligned with the empirical evidence. The magnitude of the differences between our range of projections and the projections of the Fiscal Plan is noticeably larger if we dismiss the presumably positive effects that the structural reforms will have on GNP.

And even under those optimistic assumptions, the plan falls into an "austerity trap": the target for primary surpluses are of a magnitude that lead to a decrease in GNP over a decade that is larger than the reduction in the stock of debt, leading to an increase in the debt to GNP ratio by 2026. If there was no reduction in the debt principal, and if missed payments either of interest or principal were capitalized at zero interest rate, the total public debt to GNP ratio would rise from 1.09 in 2016 to 1.41 in 2026 in the scenario projected by the Fiscal Plan.

And as figures 5a-5b and 6a-6b show, the magnitude of the austerity trap will likely be larger, as the projected debt to GNP ratio for 2026 is even larger in the large majority of the postulated scenarios.

Figure 5a

(assuming the Fiscal Plan's assumption on structural reforms hold)

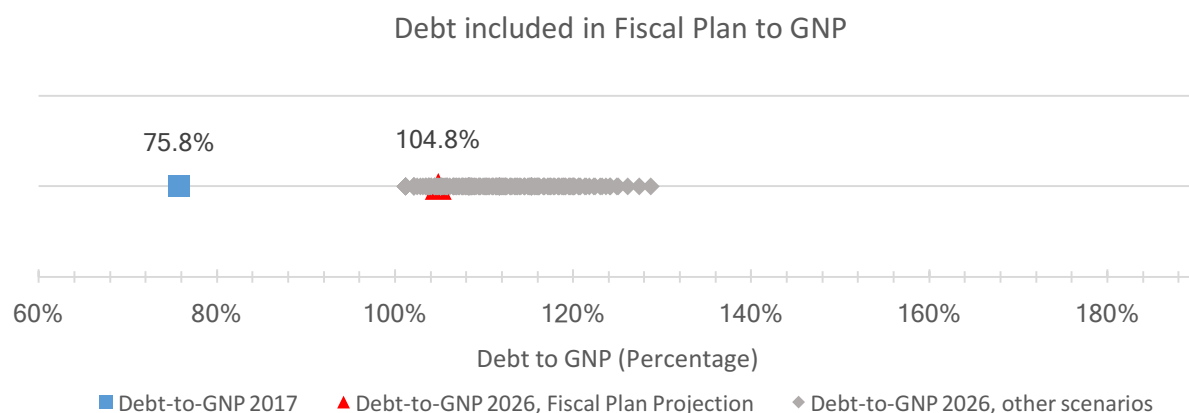


Figure 5b

(assuming structural reforms have no effect on GNP)

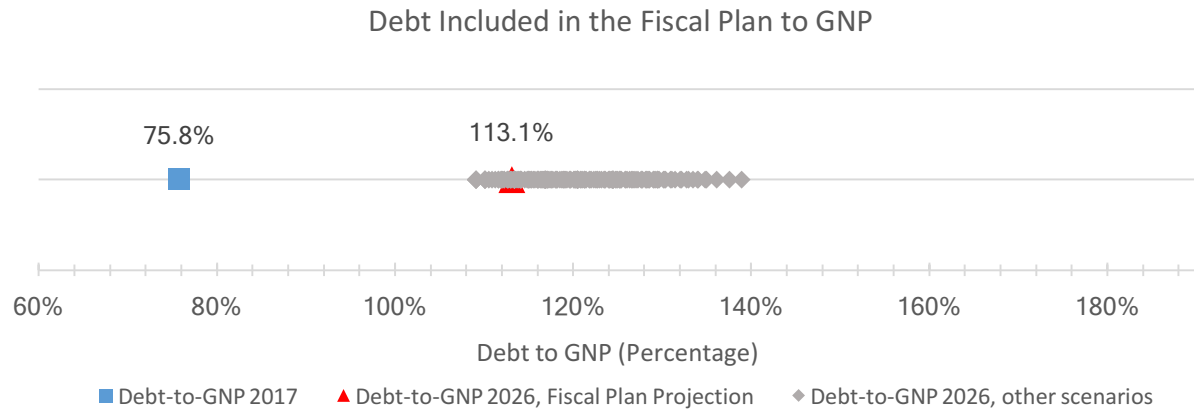


Figure 6a

(assuming the Fiscal Plan's assumption on structural reforms hold)

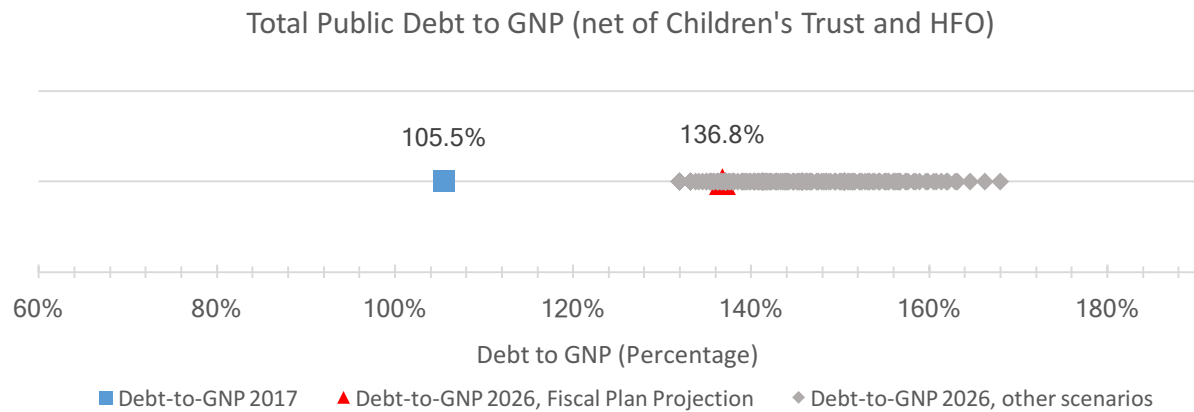
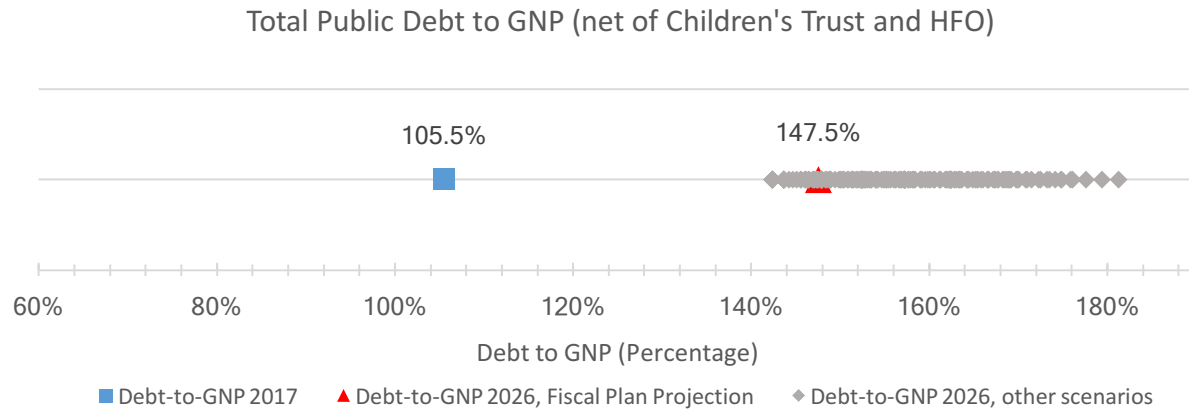


Figure 6b

(assuming structural reforms have no effect on GNP)



True, the lower-bound of our projections corresponds to projections that may be too pessimistic. Prospects should be certainly better if there is a restructuring that restores sustainability, as the baseline growth rate of GNP would probably be larger if the debt position of the territory is perceived as sustainable by market participants. But our projections call the attention on the dramatic consequences that the implementation of the Fiscal Plan could have for Puerto Rico's economy. And our projections still ignore the larger effects that the fall of economic activity could have on migration outflows.

## 5. A COMPUTATION OF PUERTO RICO'S DEBT RELIEF NEEDS

In this section, we perform a Debt Sustainability Analysis (DSA) that incorporates the expected macroeconomic dynamics implied by the Fiscal Plan in order to compute Puerto Rico's restructuring needs. The analysis includes a computation of the amount of debt relief that is required in order to restore Puerto Rico's public sector debt sustainability. More specifically, we compute the reduction in the value of Puerto Rico's public debt that would make full repayment of the restructured debt feasible with high probability, being consistent with the Fiscal Plan assumptions that the country will achieve a real GNP growth rate of 1 percent in 2026, and that will settle on that rate as a steady state.

Our DSA takes the premise that the Fiscal Plan will be respected. We assume that any discrepancy between the Fiscal Plan's GNP projections and realizations will be addressed in a way that respects the schedule of debt payments – or equivalently, the schedule of cash after measures available for debt service – established in the Fiscal Plan. Therefore, each projection will lead to the same face value of debt in 2026, because by construction we force the economy to do whatever it takes to reach the targets of fiscal revenues included in the Fiscal Plan. But each scenario will be associated with different GNP trajectories, as shown in figures 1 to 4. Thus, for each of the 192 scenarios that are defined by the assumed range of fiscal multipliers, we obtain a different value of the debt to GNP ratio for 2026,  $d^i$ , as depicted in figures 5a-5b and 6a-6b.

For each of those 192 projected debt to GDP ratios, we need to respond the following questions:

- (a) What path of primary fiscal surpluses would the economy necessitate since 2027 to satisfy the government's IBC?
- (b) Is that path feasible?
- (c) If it is not, what is the size of the debt write-down that would make the satisfaction of the government's IBC feasible with high probability?

Responding the questions above requires to take a stance on the functional form that governs the relationship between fiscal policies and GNP growth. We use exactly the same functional form that is used for the projections of the Fiscal Plan.

To perform the computations for responding (a) to (c), we make the following additional assumptions:

*Assumption i.* We take the value of the fiscal surplus to GNP ratio of 2026 as the new structural fiscal balance for year 2027 – the first year for which there is no information from the Fiscal Plan. This is an optimistic assumption, because it assumes that the increases in the fiscal surpluses achieved during 2017-2026 will become structural. If anything, this assumption leads to an underestimation of Puerto Rico's debt relief needs –consistently with our strategy of making assumptions in each step of the analysis that imply that our computations of the debt relief needs must be interpreted as lower bounds.

*Assumption ii.* With the same goal of making our computations a representation of lower-bounds, we assume that the interest payments that are missed during the period 2017-2026 are capitalized after being rolled-over to 2027 at zero interest rate. We refer to this assumption as the no-restructuring assumption.

*Assumption iii.* We assume that by 2027 the economy will have already settled on a trend of real GNP growth rate of 1 percent, as predicted by the government. We also assume that the inflation rate will settle on a trend of 1.6 percent per year since 2026 – which is the inflation rate the Fiscal Plan assumes for 2026. As discussed above, this is a controversial assumption. If the country does not implement policies that push aggregate demand, this target will likely not be met. Again, the goal is to err on the underestimation side of relief needs rather than on the overestimation side.

*Assumption iv.* Finally, we assume that the nominal interest rate stabilizes at 6 percent after the restructuring, which corresponds to a scenario of a risk free nominal interest rate of 3 percent, recovery of sustainability with probability 95 percent, and recovery rate of 46 percent in case of default. The online appendix presents the sensitivity analysis regarding this assumption.

#### THE DEBT STABILIZING PRIMARY FISCAL SURPLUS TO GNP RATIO

We search for the value of the debt stabilizing primary fiscal surplus to GNP ratio in a steady state situation. We denote this variable in scenario  $i$  as  $s^i$ , and it is defined as

$$s^i = d^i \frac{(R - g^B)}{1 + g^B}$$

where  $g^B$  is the steady state nominal GNP growth, and, as defined before,  $d^i$  is the debt to GNP ratio in scenario  $i$ , and  $R$  is the nominal interest rate that corresponds to the situation where debt has been stabilized. The debt stabilizing primary fiscal surplus denotes the value of the primary fiscal surplus as a ratio of GNP that must be achieved to satisfy the government's intertemporal budget constraint. But that value may or may not be feasible, i.e. it may or may not be achievable once we take into account the endogenous feedback effects between fiscal policies and economic performance.

Let  $s_{2026}^i$  be the structural primary fiscal balance by the end of 2026 in scenario  $i$ , i.e. the new primary fiscal balance in absence of measures by the time the Fiscal Plan ends. From 2027 onwards, we do not take a stance on what component of the primary balance (revenues or spending) will have to be adjusted in order to achieve the target of primary surplus defined for each scenario. Therefore, we assume the same multipliers for tax revenues and public spending for each combination  $i$ :  $\alpha_{G,Y}^i = \alpha_{T,Y}^i = \beta^i$ . We redefine the function that determines the effects of fiscal contractions on real GNP growth as

$$g_t^{y,i} = g_t^b - \beta^i \Delta s_t^i \quad (1)$$

which, as stated, is the same function used for the Fiscal Plan projections. We assume  $\beta^i = \alpha_{G,Y}^i$  for each  $i$ .<sup>21</sup>

Computing  $s^i$  requires a series of iterations until the economy stabilizes on a path of constant nominal GNP growth and stable debt-to-GNP ratio.

The iteration process works as follows:

Step 1: Under the no-restructuring assumption, we compute  $d^i$  for each  $i$  for 2026.

Step 2: For each  $d_{2026}^i$ , we compute  $s^i$ . If  $s^i \neq s_{2026}$ , the economy will not be in a steady state situation, and then we need to compute  $g_{2027}^{i,Y}$ , where  $g_{2027}^{i,Y}$  is the nominal growth rate of GNP in scenario  $i$ . This will result in new  $d_{2027}^i$  that will differ from  $d_{2026}^i$ .

Step 3: For the new value of  $d_{2027}^i$ , we compute again the new  $s^i$ . If  $s^i \neq s_{2027}$ , then  $g_{2027}^{i,Y} \neq g_{2027}^B$ , and we need to compute  $d_{2028}^i$ .

Step 4 to N: This iteration will continue until  $s_t^i = s_{t-1}^i$ , with  $g_{t-1}^{i,Y} = g_t^{i,Y} = g^B$ . At that moment (step N), we get a constant  $s^i$  that satisfies the government's IBC.

Results: The debt stabilizing primary fiscal surpluses to GNP and the evolution of debt to GNP ratios

<sup>21</sup> For each public spending to real GNP multiplier, once we take into account the endogenous feedback effects from public spending contractions on tax revenues, we can find a lower associated value of  $\beta^i$ .



In the absence of restructuring, the debt included in the Fiscal Plan to GNP ratio would have to stabilize at values from 1.04 (when  $\alpha_{G,Y} = 1.34$ ,  $\alpha_{G,T} = 0$ ,  $\alpha_{T,Y} = 0$ ) to 1.45 (when  $\alpha_{G,Y} = 3.5$ ,  $\alpha_{G,T} = 0.7$ ,  $\alpha_{T,Y} = -1.34$ ), and the total public debt (net of Children's Trust and HFO) to GNP ratio would have to stabilize at values from 1.38 to 2.04. The lower bound of 1.04 corresponds to  $s = 0.035$ , and the upper bound corresponds to  $s = 0.074$ . Under the Fiscal Plan assumptions, those ratios take values of 1.08 and 1.43 respectively, and in 2026 they take values of 1.04 and 1.36 respectively.

Therefore, in absence of any relief, Puerto Rico should achieve primary fiscal surpluses between 3.5% and 7.4% of GNP after the end of current Fiscal Plan, forever. Under the Fiscal Plan's assumptions, the primary surpluses after 2028 should be 3.5% or 4.7% of GNP, forever, depending on whether the relevant debt stock is the one included in the Fiscal Plan or the total public debt net of Children's Trust and HFO. Table 6 summarizes these findings. These results strongly suggest that Puerto Rico's public debt is unsustainable. We will next reinforce this claim arguing that those targets would be unfeasible – they would undermine the functioning of the economy to an extent that would make them simply impossible to achieve.

Table 6: Debt-stabilizing primary fiscal surplus,  $R = 0.06$ ,  $g^B = 0.026$

Scenarios	Measure of debt	Fiscal Plan assumptions on structural reforms	Mean	Minimum	Maximum
192	Total public debt net of Children's Trust and HFO	No	5.8%	4.9%	7.4%
192	Debt included in Fiscal Plan	No	4.3%	3.7%	5.2%
192	Total public debt net of Children's Trust and HFO	Yes	5.3%	4.6%	6.7%
192	Debt included in Fiscal Plan	Yes	3.9%	3.5%	4.7%

#### ON THE FEASIBLE PRIMARY FISCAL BALANCE PATHS

The functional form (1) used for the Fiscal Plan projections relates the growth rate of GNP to the change in the primary surplus, but it does not relate it to the level of the primary surplus. Then, even if the government is forced to sustain primary surpluses of 7 percent of GNP forever, according to that function that would not affect the performance of the economy in the long term. The only period in which economic activity would be affected would be the one in which the large contraction to achieve the target of 7 percent occurs.

But such premise is of course flawed. The need to maintain massive primary surpluses for a long time would have significant effects on the possibilities of the government to implement development policies. A draconian plan as requiring constant primary surpluses between 4.7 to 7 percent of GNP would entail drastic cuts to spending in items of the public budget as education, health, pensions, and R&D, that would have long term effects. The targets would be inconsistent with the baseline assumption of convergence to a real GNP growth rate of 1%.

The IMF DSA framework and its fan charts approach provide a helpful basis for complementing our analysis. IMF (2011) recognizes that sustained large surpluses are not common, and incorporates this constraint in its debt sustainability analyses; it reports that out of a sample of 87 countries, only 16 countries (less than 20 percent) sustained surpluses exceeding 5 percent of GDP for five years or longer. Some episodes of sustained large surpluses were related to specific conditions that are not easily applicable to most countries. Out of the 16 countries that recorded episodes of sustained surpluses, five had this performance in connection to exogenous factors—large increases in revenues related to natural resources (Botswana, Chile, Egypt, and Uzbekistan) or transfers arising from customs union membership (Lesotho). Episodes of sustained large surpluses in the absence of facilitating exogenous factors have been limited to 11 countries (13 percent of the sample). And a few of these countries ran large primary surpluses in the absence of a large debt burden (Denmark, New Zealand, Turkey). The ones that sustained sustained surpluses exceeding 5 percent of GDP for five years or longer at times where debt levels were above 60 percent of GDP were Belgium, Canada, Dominica, Israel, Jamaica, Panama, Seychelles, and Singapore. And no country targeted those values forever.

Besides, there is no evidence that supports the premise that targeting those high primary fiscal surpluses has been associated with recoveries in situations of distress. Indeed, four of those eight economies faced situations that are significantly different from the one of debt distress Puerto Rico is facing (Belgium, Canada, Israel, and Singapore were in situations where austerity could ensure the sustainability of the public sector without triggering a self-defeating macroeconomic process). Dominica combined a debt restructuring in 2004 with an average primary fiscal surplus of 3.9 percent of GDP for the period 2004-2008 and an average fiscal surplus of 1.19 during the decade that followed the restructuring; Jamaica has been keeping sizable primary fiscal surpluses since its last debt restructuring in 1990, on average of 7.48 of GDP, and the economy has suffered the consequences: the unemployment rate has kept at two digits for almost the entire period, and the government's debt to GDP ratio is at about

the same levels now as in 1990, above 120 per cent; Panama combined two debt restructuring episodes in 1994 and 1996 with an average primary fiscal surplus of 1.08 percent of GDP in the decade that followed the latter restructuring; and Seychelles combined a debt restructuring in 2010 with an average primary fiscal surplus of 5.98 percent of GDP during the period 2010-2015 – in a context of significant increases in the prices of its exports. And the most important, the primary surplus is an endogenous outcome; if a country recovers due to the implementation of an appropriate mix of policies that include a debt restructuring, obtaining primary surpluses becomes a more likely outcome.

In summary, while there is no evidence that suggests that a country in a situation of debt distress, in a demand-constrained regime, can do well by avoiding a restructuring through the achievement of very large primary fiscal surpluses, there is evidence that tells that long periods of large primary fiscal surpluses are rare, and that a restructuring has been almost always ultimately unavoidable under those circumstances.

We conclude that if Puerto Rico's government need to collect primary surpluses in the order of 3.5% to 7.4% of GNP after 2027 forever, this means that Puerto Rico's debt is unsustainable, and that it needs to be restructured to a level where the required path of primary fiscal surpluses becomes feasible.

#### COMPUTING THE NECESSARY DEBT RELIEF TO RESTORE DEBT SUSTAINABILITY

The debt position that can be deemed as sustainable with high probability depends on the path of fiscal policies that are considered feasible.

To compute the necessary relief to restore sustainability, we first compute the stabilizing debt to GNP ratio for values of  $s$  from the value that corresponds to each of our projections for 2026,  $s_{2026}$  (the range of these values goes from 0.012 to 0.016) to a maximum of 0.035. Next, we calculate the necessary relief for restoring sustainability as the difference between the debt to GNP ratio in scenario  $i$  in 2026 and the stabilizing debt to GNP ratio for  $s = \{s_{2026}, 0.015, 0.02, 0.025, 0.03, 0.035\}$ .

We perform these computations for two groups of scenarios:

- (i) First, we assume that the Fiscal Plan's assumptions on the effects of the structural reforms on GNP hold.

- (ii) Second, we assume that the structural reforms stated in the Fiscal Plan have no effects on GNP growth during the period 2017-2026.

The results are summarized in figures 7 to 12 and in tables 7 to 12. The results correspond to the necessary face value reduction, assuming that there will be a full write-off the debt interest whose payment has not been scheduled in the Fiscal Plan, that should have been achieved in 2017 before Hurricane Maria through a restructuring process, assuming the debt service scheduled in the Fiscal Plan will be respected.

Figure 7a: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth as % of total relevant debt – Relevant debt: Debt included in Fiscal Plan

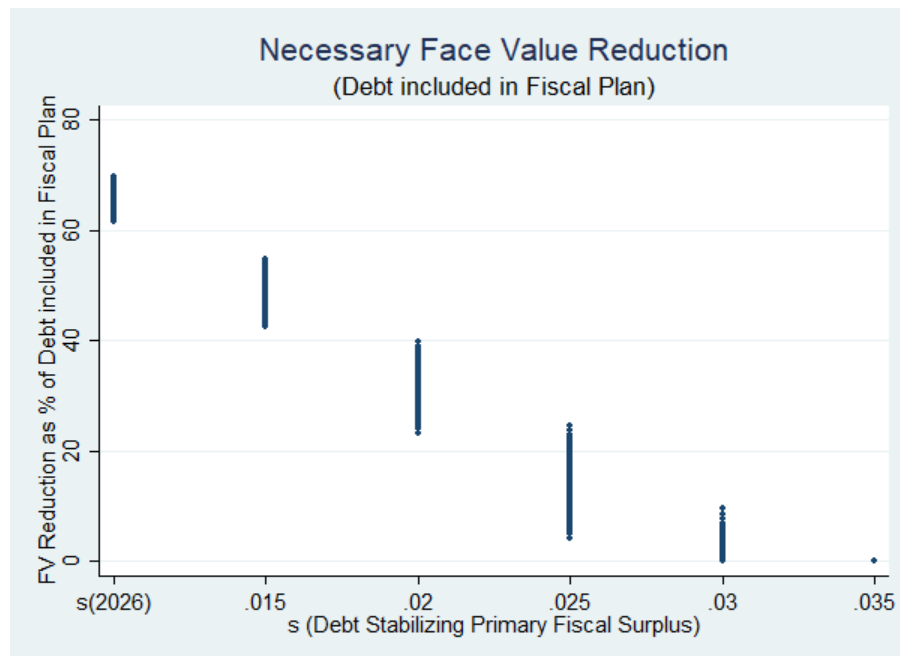


Figure 7b: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth in billions of \$ – Relevant debt: Debt included in Fiscal Plan

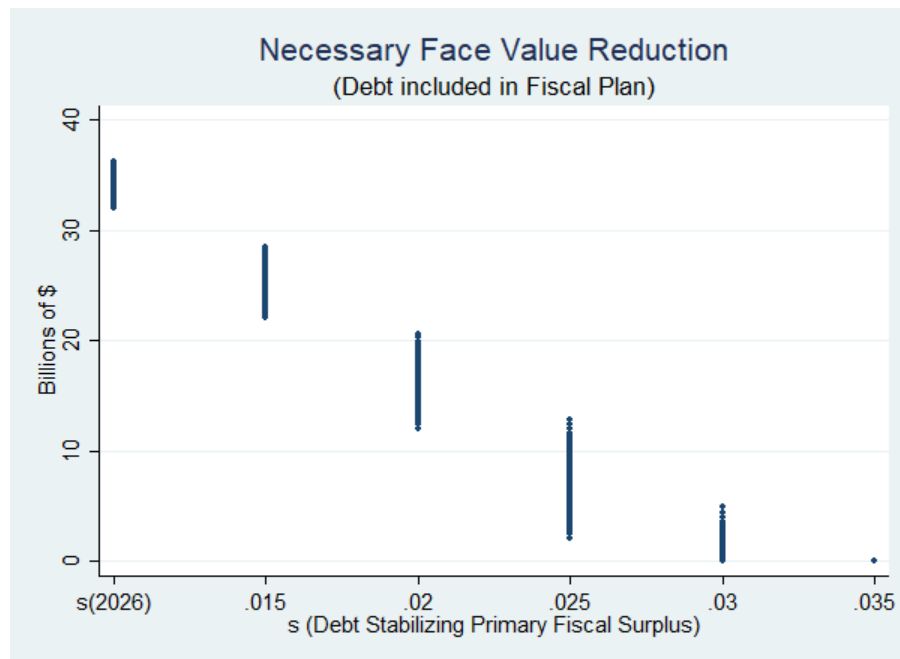


Table 7: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth, as % of total relevant debt – Relevant debt: Debt included in Fiscal Plan

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Min Face Value Reduction (% of total current public debt)	Max Face Value Reduction (% of total current public debt)	Face value reduction under Fiscal Plan multiplier assumptions
s2026	192	61.6	69.8	63.0
0.015	192	42.4	54.7	44.4
0.02	192	23.2	39.7	25.9
0.025	192	4.0	24.6	7.4
0.03	192	0.0	9.5	0.0
0.035	192	0.0	0.0	0.0

Figure 8a: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth, as % of total relevant debt – Relevant debt: Total Public Debt Net of Children’s Trust and HFO

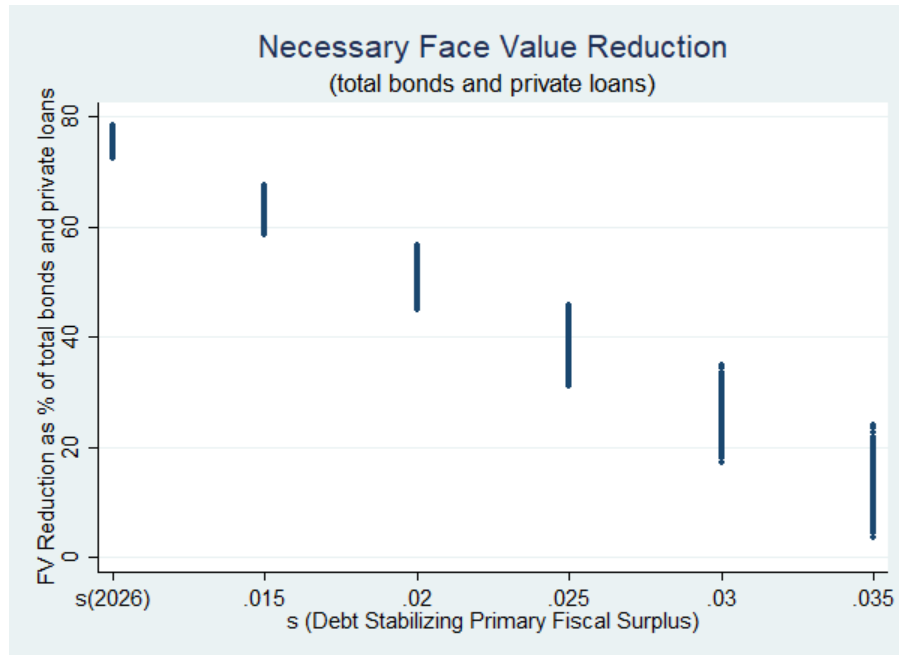


Figure 8b: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth, in billions of \$ – Relevant debt: Total Public Debt Net of Children’s Trust and HFO

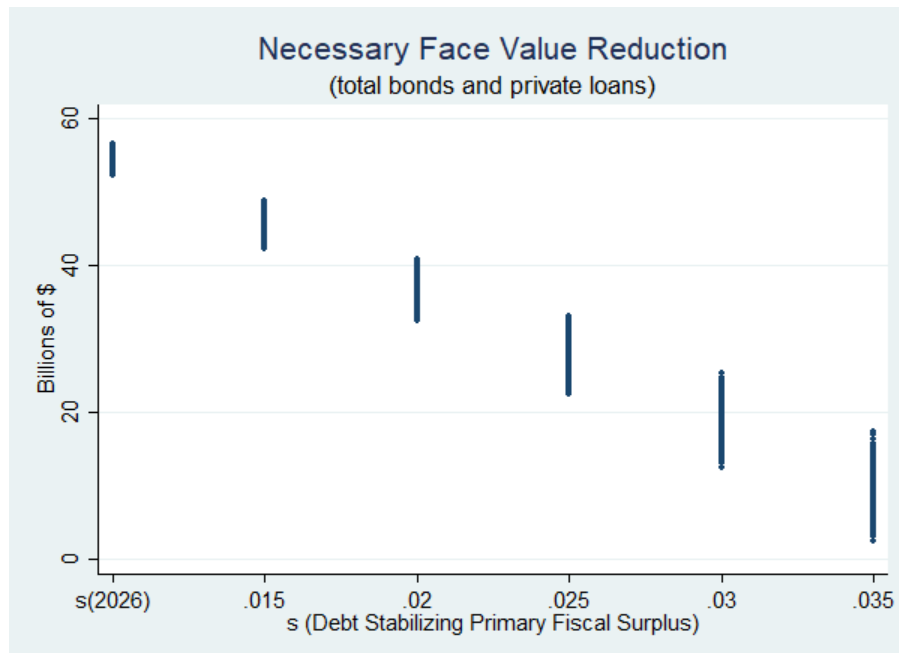


Table 8: Necessary face value reduction under the Fiscal Plan assumption on the effects of structural reforms on GNP growth, as % of total relevant debt – Relevant debt: Total Public Debt Net of Children’s Trust and HFO

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Min Face Value Reduction (% of total current public debt)	Max Face Value Reduction (% of total current public debt)	Face value reduction under Fiscal Plan multiplier assumptions
s2026	192	72.4	78.3	73.4
0.015	192	58.6	67.5	60.1
0.02	192	44.8	56.6	46.8
0.025	192	31.1	45.8	33.5
0.03	192	17.3	35.0	20.2
0.035	192	3.5	24.1	6.9

Figure 9a: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, as % of total relevant debt – Relevant debt: Debt included in Fiscal Plan

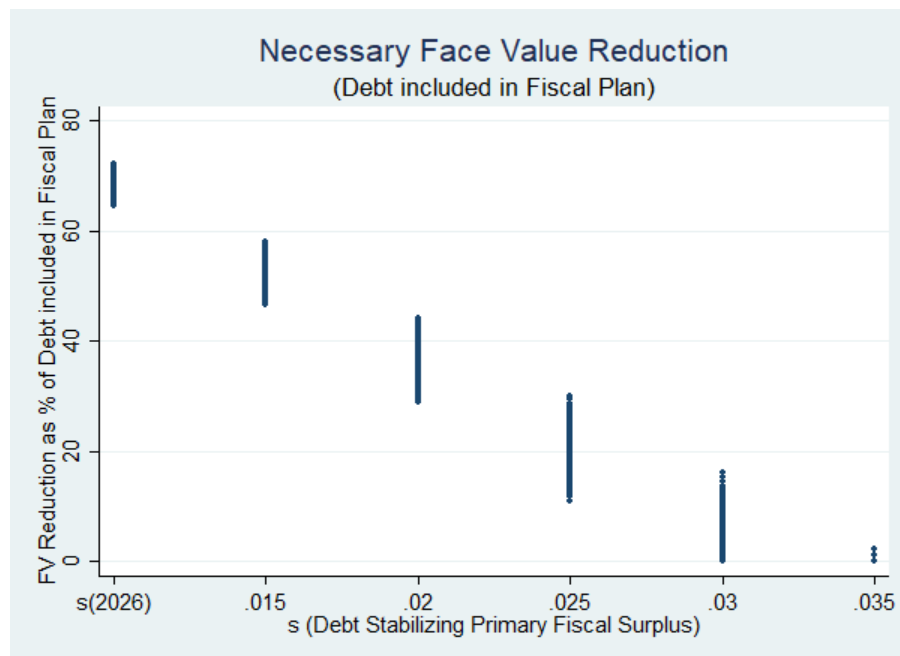


Figure 9b: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, in billions of \$ – Relevant debt: Debt included in Fiscal Plan

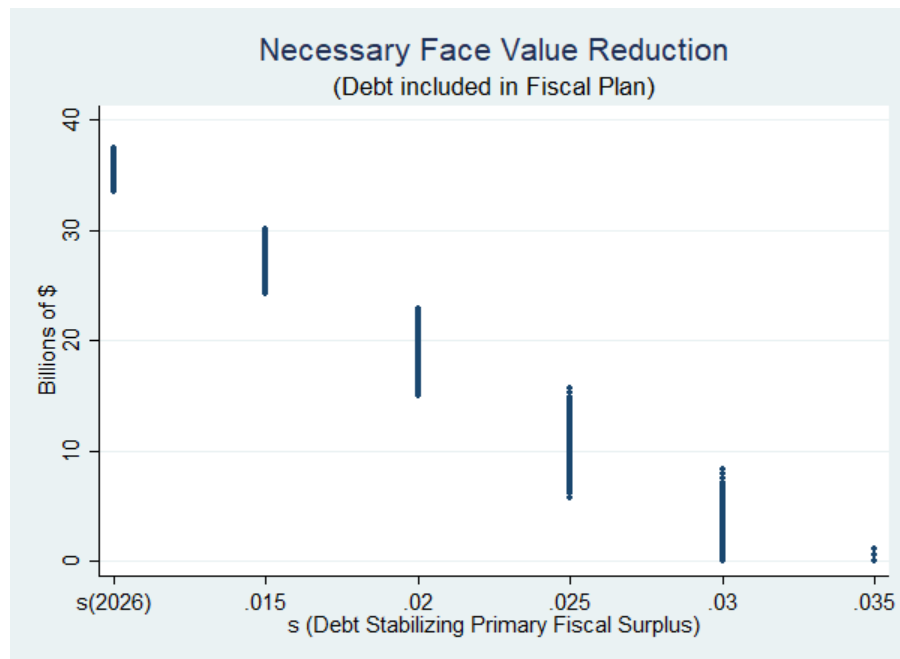


Table 9: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, as % of total relevant debt – Relevant debt: Debt included in Fiscal Plan

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Min Face Value Reduction (% of total current public debt)	Max Face Value Reduction (% of total current public debt)	Face value reduction under Fiscal Plan multiplier assumptions
s2026	192	64.4	72.0	65.7
0.015	192	46.6	58.1	48.5
0.02	192	28.8	44.1	31.3
0.025	192	11.0	30.1	14.1
0.03	192	0.0	16.1	0.0
0.035	192	0.0	2.2	0.0



Figure 10a: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, as % of total relevant debt – Relevant debt: Total Public Debt Net of Children's Trust and HFO

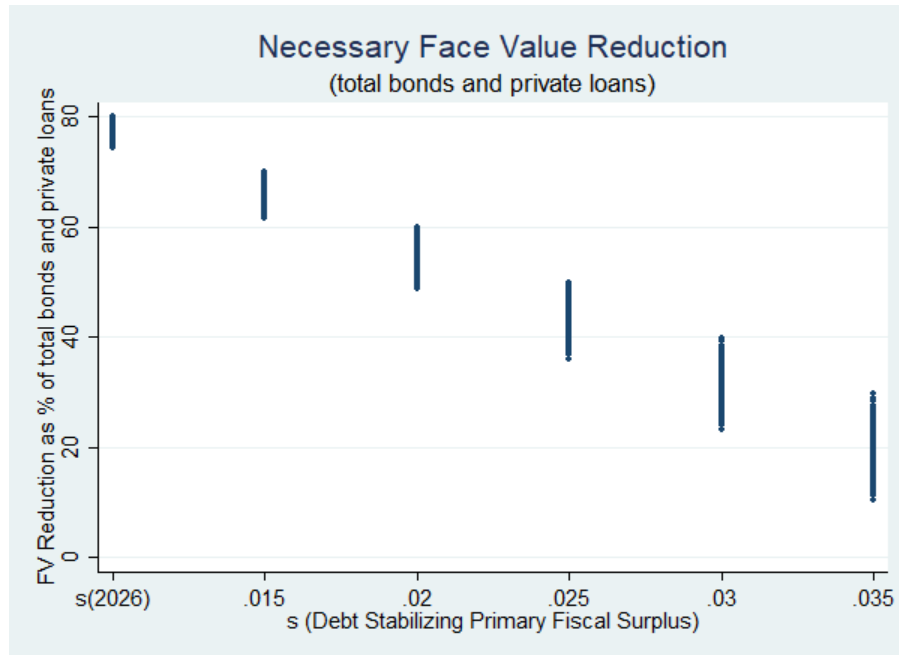


Figure 10b: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, in billions of \$ – Relevant debt: Total Public Debt Net of Children's Trust and HFO

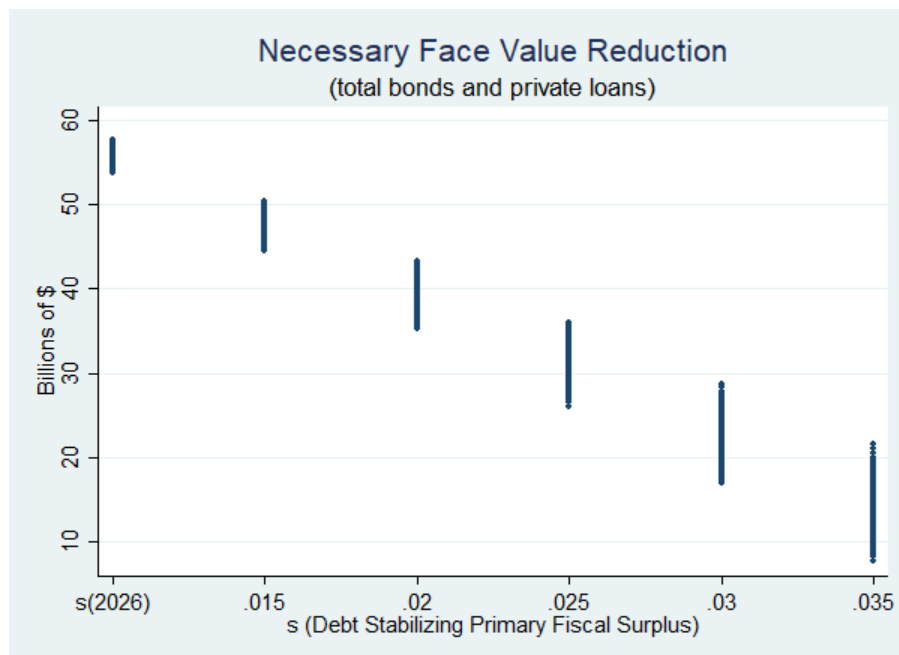


Table 10: Necessary face value reduction under the assumption that structural reforms have no effects on GNP growth, as % of total relevant debt – Relevant debt: Total Public Debt Net of Children’s Trust and HFO

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Min Face Value Reduction (% of total current public debt)	Max Face Value Reduction (% of total current public debt)	Face value reduction under Fiscal Plan multiplier assumptions
s2026	192	74.4	79.9	75.3
0.015	192	61.6	69.9	63.0
0.02	192	48.9	59.8	50.7
0.025	192	36.1	49.8	38.3
0.03	192	23.3	39.8	26.0
0.035	192	10.5	29.7	13.6

Figure 11: Sustainable debt under the Fiscal Plan assumption on the effects of structural reforms on GNP growth, in billions of \$

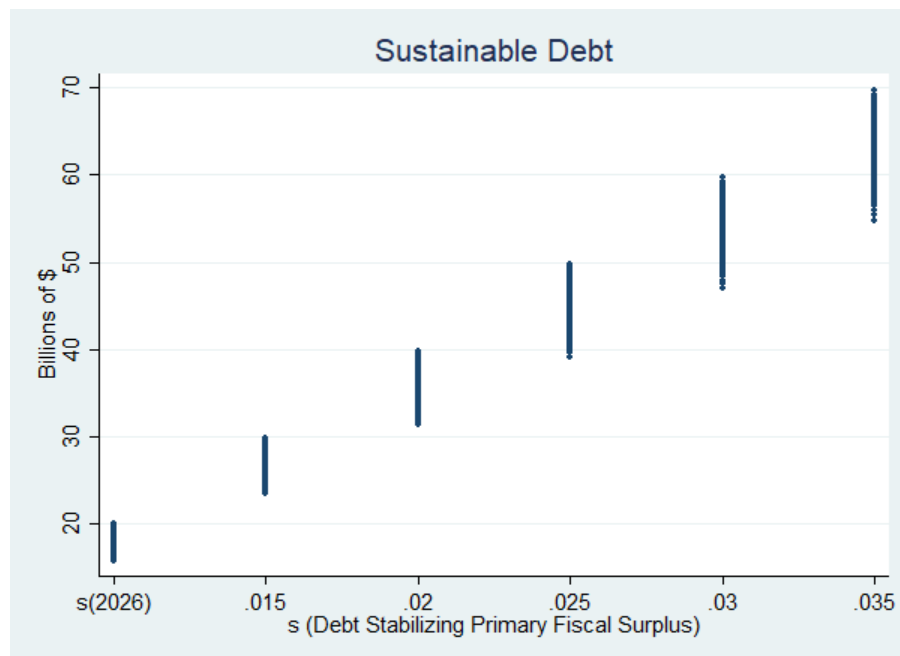


Table 11: Sustainable debt under the Fiscal Plan assumption on the effects of structural reforms on  
GNP growth, in billions of \$

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Sustainable Debt (Billions of USD)		
		Minimun	Maximun	Under government multiplier assumptions
s2026	192	15.7	19.9	19.2
0.015	192	23.5	29.9	28.8
0.02	192	31.3	39.9	38.5
0.025	192	39.2	49.8	48.1
0.03	192	47.0	59.8	57.7
0.035	192	54.8	69.8	67.3

Figure 12: Sustainable debt under the assumption that structural reforms have no effects on GNP  
growth, in billions of \$

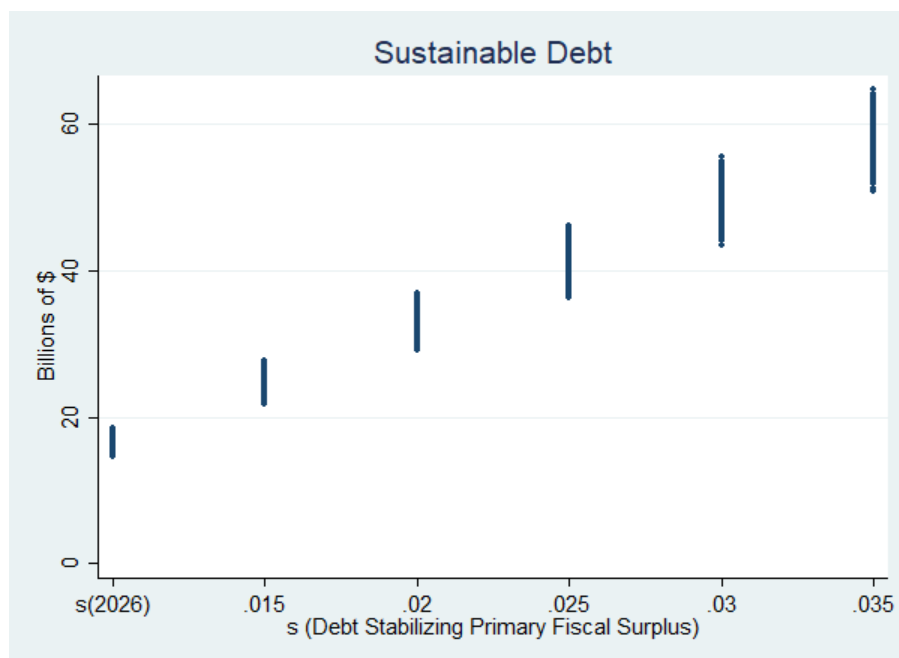


Table 12: Sustainable debt under the assumption that structural reforms have no effects on GNP growth, in billions of \$

Debt stabilizing primary surplus to GNP since 2027	No. of scenarios	Sustainable Debt (Billions of USD)		
		Minimum	Maximum	Under government multiplier assumptions
$s_{2026}$	192	14.5	18.5	17.8
0.015	192	21.8	27.7	26.7
0.02	192	29.0	37.0	35.7
0.025	192	36.3	46.2	44.6
0.03	192	43.5	55.4	53.5
0.035	192	50.8	64.7	62.4

To reach a conclusion on the necessary relief needs for Puerto Rico, we need to take a stance on the set of feasible values of  $s$ . Even under the most optimistic projections the economy will have a lower GNP in 2026 than in 2016, and as was described above, the projected debt to GNP ratio absent a restructuring will be larger. The Fiscal Plan projects the evolution of primary fiscal surplus to GNP ratios that is described in Table 13. Requiring a larger  $s$  after 2027 than the values of  $s_{2026}$  would not be a sensible stance; the economy is projected to be in worse in shape 2027 than at the moment we perform this analysis, hence being even more ambitious in terms of the fiscal targets would not lead to better outcomes than the ones projected for the next decade. Instead, being overly ambitious with the primary fiscal surplus targets would most likely lead to another lost decade after 2027.

Table 13: Fiscal Plan projections of primary fiscal surpluses to GNP ratio, 2017-2026

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
$s$	0.0161	0.0107	0.0089	0.0114	0.017	0.0145	0.0137	0.0118	0.0112	0.0122

Source: Fiscal Plan 2017-2026

For a stable primary fiscal surplus after 2027 that takes values between  $s_{2026}$  and 1.5 percent of GNP, the necessary debt reduction includes the full cancellation of interest payments not included in the Fiscal Plan plus a face value reduction that under the Fiscal Plan assumptions should be between 44.4 percent and 63 percent if the relevant debt stock is \$51.9 billions (table 7, column “Face value reduction under Fiscal Plan multiplier assumptions”), and between 60.1 percent and 73.4 percent if the relevant debt stock is \$72.2 billions (table 8, column “Face value reduction under Fiscal Plan multiplier assumptions”). Under a broader range of assumptions that include different values for the fiscal multipliers and under the assumption of no effects of structural reforms on GNP growth, the debt reduction should include the full cancellation of interest payments not included in the Fiscal Plan plus a face value reduction of between 46.6 and 72 percent if the relevant debt stock is \$51.9 billions (Table 9, column “Min Face Value Reduction” for  $s = 0.015$  and column “Max Face Value Reduction” for  $s = s_{2026}$ , respectively), or between 61.6 and 79.9 percent if the relevant debt stock is \$72.2 billions (Table 10, column “Min Face Value Reduction” for  $s = 0.015$  and column “Max Face Value Reduction” for  $s = s_{2026}$ , respectively). Clearly, Puerto Rico needs substantial relief. But the interpretation of these results must take into account important caveats, to which we next turn our attention.

## INTERPRETATION OF OUR RESULTS

Our computations show that in order to restore debt sustainability with high probability the restructuring should deliver a substantial reduction of Puerto Rico’s debt. The figures we presented are “macroeconomic” figures that do not establish how the debt write-off should be distributed across the different bond series. And these are conservative estimates due to a number of reasons.

First, we have kept throughout all the computations the Fiscal Plan assumption that annual real GNP growth will reach 1 percent in 2027, and we assume that this will correspond to a new steady state. But if the Fiscal Plan 2017-2026 is respected, for the reasons discussed in this study, getting to that state will be an unlikely outcome. If no expansionary aggregate demand policies are implemented to escape out of the current depression, the appropriate relief to restore sustainability will have to be the entire current stock of debt. Puerto Rico has no capacity to repay today, and if it does not recover, it will not improve its repayment capacity in the future either.

Second, as we described above, in every step of our analysis we made conservative assumptions as to err on the “too little” side of debt relief.

A final caveat is that we do not study how the write-off will be distributed, and this is an issue that will have macroeconomic effects. The expansionary effects of the restructuring will be increasing in the fraction of the write-off that falls on external bondholders, rather than on domestic bondholders, as far as the marginal propensity to spend in Puerto Rico’s economy is lower for external than for domestic bondholders. The evidence supports this basic theoretical insight, as it shows that the macroeconomic costs of a default are increasing in the proportion of debt held by domestic residents (see Alessandro, 2011; Guembel and Sussman, 2014) and are highly related to the transmission through the balance sheets of domestic banks (cf. Gennaioli, Martin, and Rossi, 2014). This is matter that must receive policy attention.<sup>22</sup>

## GNP LINKED BONDS

A non-contingent debt relief is always exposed to the risk that ex-post the relief ends being “too little” – harming the recovery – or “too much” – implying that creditors could have got more without undermining sustainability. To deal with the uncertainty that is present at the time of the restructuring, the proposal could include GNP growth linked bonds, that relate the debt payments to the evolution of the territory’s GNP. These instruments would improve sustainability, as the payments would be related to the payment capacity of the debtor; and they would also align the interests of creditors and the debtor, as both would benefit from a larger recovery. The economic rationale has been largely developed in the literature (see Borensztein and Mauro 2004, for a review, and Barr, Bush, and Pienkowski 2014, for a more recent contribution, as well as Robert Shiller’s related proposal to create “macro markets” for GDP-linked securities (Shiller, 1993, 2003)).

Despite their virtues, the implementation of this type of contingent debt has not been straightforward. In practice, securities with a return linked to economic growth have been issued only in

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<sup>22</sup> However, there are important binding constraints for designing a selective default strategy that requires targeting the bondholdings of foreigners, as these bonds are actively traded in secondary markets (see Broner, Martin, and Ventura, 2010; Broner and Ventura, 2011). Besides, the transfer from domestic bondholders to the state that the restructuring would entail will still be expansionary in the short run if the government uses the funds for policies that have a larger macroeconomic expansionary effect. And the larger space for public policies can also have positive long-term consequences.

the context of debt restructurings, including those in Bulgaria (1994), Argentina (2005)<sup>23</sup>, Greece (2012), and Ukraine (2015). To date, no advanced economy has issued growth-indexed bonds in normal times. But the support in policy spheres has been increasing (Blanchard, Mauro, and Acalin, 2016).

Puerto Rico's restructuring should try to adopt them. Our computations provide insights for their design, because they show what would be the necessary relief as a function of the realizations of GNP. However, this will not be a trivial task. If markets do not give value to them, it would not be sensible for the debtor to just give them away for free. The value of this instrument will of course be contingent on their market value, which in turn will depend on how well understood they are.

## **6. THE NEED FOR A NEW DEVELOPMENT STRATEGY**

The debt restructuring is a necessary but not a sufficient condition to drive Puerto Rico's economy onto a path of sustained and dynamic economic growth. Puerto Rico will need to do more than just the restructuring; it will also need to replace a structure of production that failed to deliver the productivity growth and the job opportunities that the territory's development goals require by another one that can lead to a superior trajectory of long-term growth with social inclusion.

### **WHEN DEBT RESTRUCTURING IS SUFFICIENT TO RESTORE A DYNAMIC PATH OF ECONOMIC GROWTH**

A debt restructuring happens to be sufficient to resolve the problems of a distressed economy only under very special circumstances. To illustrate the difference between a situation when the restructuring is a sufficient condition versus the case in which it is only a necessary condition, let's compare two different debt dynamics of two hypothetical islands that end up in situations of debt distress.

In one island, that we will call Green Island, real output was growing at 2 percent per year, and everyone – the islanders and the creditors – was thinking that that output growth rate corresponded to a steady state situation. In that island the debt-to-output ratio had stabilized. But suddenly, the island is hit

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<sup>23</sup> Argentina implemented a variant of known as GDP warrants. But the results of the experiment were ambiguous. On the one hand, the warrants paid off extremely well, benefitting the creditors who kept them in their portfolios. But on the other hand, they were not well received by markets at the time of issuance. This may have had to do with their complex design, that made pricing difficult: the trigger for the payment was a threshold growth rate of GDP, but the formula for the amount of payments depended on the difference between the actual level of GDP and a threshold level (see Cruces and Samples (2016), Guzman (2016), and Benford, Best, and Joy (2016) for details).

by an external and rare large shock, like a tsunami, that destroys its infrastructure. The destruction of the infrastructure reduces the production capacity, increasing the debt-to-output ratio. Now Green Island owes a larger share of its output, and absent public policies that help rebuilding the production capacity, the island will be permanently poorer. The island's public sector could have dealt with this situation if the shock was smaller, redefining the public policies' priorities as to rebuild the island's infrastructure. But with a shock of this size, it cannot. Creditors understand what is going on, and revise their perceptions of the Green Island's debt sustainability. The borrowing cost increases, and the island has to set aside an even larger share of its output to repay the higher debt interests. The public sector may decide to cut salaries, which depresses the aggregate demand. Some sectors that depend on the domestic demand will face more troubles; aggregate production will decrease even further, creating a debt spiral.

In this context, an appropriate debt restructuring will suffice to resolve the problem. The debt relief will release resources that can be used to rebuild Green Island's infrastructure, taking it back to its pre-shock growth dynamics of annual real output growth of 2 percent. The restructuring makes the effects of the negative shock transitory, while the lack of restructuring would have made them permanent. This is not the situation Puerto Rico is experiencing.

#### **WHEN DEBT RESTRUCTURING IS ONLY A NECESSARY CONDITION TO RESTORE A DYNAMIC PATH OF ECONOMIC GROWTH**

Let's now turn our attention to another island, Brown Island. Brown Island's real output had also been growing at 2 percent per year and there was also a shared perception that the economy had permanently settled on that growth path. The island was borrowing and creditors were lending under terms that reflected that perception. But at some point doubts about Brown Island's growth prospects start to appear.

The doubts get quickly reaffirmed, and social perceptions change drastically: now, the shared view is that the island's structure of production is not as dynamic as previously believed, and cannot deliver a real output growth rate of 2 percent permanently. Growth prospects are significantly revised downwards. The new expected steady state real growth rate is 0 percent. The labor demand and investment fall, output falls, and the burden of debt relative to output increases.



If the revision in expectations is sufficiently large, the island's debt will become unsustainable. Like Green Island, Brown Island will also be in trouble if it does not contain the debt spiral through a restructuring. But unlike the case of Green Island, the debt restructuring will not suffice to bring Brown Island back to a real output growth path of 2 percent. Instead, it will only serve to contain destabilizing dynamics; it will allow the economy's real output to grow at the new steady state of 0 percent, but not at the old perceived steady state of 2 percent.

If Brown Island wants to go back to a more dynamic growth path as one where real output grows at 2 percent per year, it will need to do more than just a debt restructuring: it will need to implement reforms that change the structure of production to one that is indeed more dynamic. It will need a new growth strategy. But absent the restructuring, Brown Island will not have the resources to do the productive policies that the new growth strategy requires.

If in the context of this situation of an unsustainable debt burden Brown Island gets hit by a significant negative external shock, as a hurricane that devastates the basic infrastructure of the island, the resolution of the crisis will require even deeper actions. The island will not only need to change the structure of production, but it will also need to rebuild its basic infrastructure in the first place as to at least maintain its the pre-shock stagnant growth dynamics, or else the economic activity will simply collapse. Such a shock will increase the magnitude of the necessary debt relief to restore sustainability – and a sufficiently large shock could increase the island's needs to an extent to which even a full debt write-off would not suffice for restoring the conditions that would make the recovery feasible. In such a negative scenario, Brown Island's future be conditioned by the amount of external help that it receives in the aftermath of the shock.

## **7. CONCLUSIONS**

The most urgent structural reform that Puerto Rico needs is a debt restructuring that provides substantial debt relief. The computation of the size of the restructuring needs requires a careful debt sustainability analysis based on sound economic theory and on assumptions that are aligned with the empirical evidence. The analysis must also be transparent about the methodology and its assumptions. This is precisely the kind of analysis that this study offers.

We made two main contributions. First, our results shed light on the consequences of the Fiscal Plan for the period 2017-2026. Our analysis suggests that the fiscal plan will more likely lead to a 'lost decade' in terms of economic activity and will worsen the sustainability of the debt position. We identified a number of problems with its assumptions, and showed that the fiscal plan's choice of assumptions led to overoptimistic projections – but even the Fiscal Plan's optimistic projections indicate that Puerto Rico's real GNP will be lower by 2026 than today.

If the Fiscal Plan's projections do turn out to be overoptimistic, there will need to be adjustments to the Fiscal Plan over the course of the decade. Our analysis also sheds light on the consequences of the different possible policy reactions to the eventual discrepancies between projections and realizations. Forcing more austerity when the realized fiscal revenues fall short of the projected values would aggravate the depression and worsen debt sustainability.

Second, our analysis informs what are the actual restructuring needs of the territory. If the Fiscal Plan is implemented, its contractionary consequences will basically make the entire debt burden unpayable. The Fiscal Plan assumes that the entire recovery will come from structural reforms that affect the formation of aggregate supply, but that assumption is flawed. Even though our analysis does not deny the importance of supply side reforms in a longer term, we consider that the effectiveness of any supply side reform meant to increase the economy's long-term productivity will depend on how the current macroeconomic crisis is handled. In the current demand-constrained regime, Puerto Rico will not recover if it does not recover the capacity for implementing policies that expand the aggregate demand.

An analyst that believes in the validity of the Fiscal Plan's assumptions would conclude that the necessary reduction of Puerto Rico's public debt should include a full cancellation of interest payments not scheduled in the Fiscal Plan, plus a face value reduction of between 44.4 percent and 73.4 percent of the current stock, where the appropriate range depends on whether the relevant debt stock is \$51.9 billions or \$72.2 billions. Clearly, the relief should be substantial even under the unrealistic assumptions of the Fiscal Plan. Under a broader range of assumptions that include different values for the fiscal multipliers and that assume that the Fiscal Plan's structural reforms will have no effects on GNP growth during the period 2017-2026, and under the assumption that by maintaining constant primary fiscal surpluses between 1.2 and 1.6 of GNP after 2027 will be consistent with a real GNP steady state growth rate of 1 percent, the debt reduction should be between 46.6 and 79.9 percent of the current stock (again,

the appropriate range includes larger values if the relevant debt stock is \$72.2 billions instead of the \$51.9 billions included in the Fiscal Plan).

We consider that the appropriate approach for dealing with Puerto Rico's crisis is markedly different than the one that is being pursued. A plan for resolving the crisis must start with the premise that the restructuring proposal and the fiscal plan are interdependent. An appropriate plan would begin by crafting a restructuring proposal that provides substantial relief as implied by our computations. The recovery of the sustainability of the debt position would bring two direct benefits: it would release resources for the implementation of public policies, and it would decrease the uncertainty about Puerto Rico's prospects which in turn would increase the size of the multipliers associated with expansionary fiscal policies. The next element should be the implementation of expansionary fiscal policies in the short run. The moment where Puerto Rico most needs expansionary policies is now. But even if the territory were to make zero payments on its debt, it would still face constraints for running expansionary fiscal policies as it has a primary fiscal deficit. Thus, the implementation of expansionary policies requires something else. That something else should be a clause of lending into arrears or debtor in possession, that makes new creditors senior to old creditors. This would relax borrowing constraints, facilitating access to the credit markets when it is more necessary – and in a context of sustainable debt that would be guaranteed by the deep restructuring.<sup>24</sup>

We also claimed that the restructuring plan should consider the adoption of GNP linked bonds. This would improve sustainability, as the scheduled payments would be aligned with the actual payment capacity of the territory. And it would align the interests of the debtor and its creditors.

The debt restructuring process should not be delayed. Given the uncertainty about the future of Puerto Rico's economy, from the viewpoint of creditors it may pay off to delay the initiation of the restructuring process, to wait and see if the recovery is larger than what is projected, which would decrease the debt relief needs. However, the recovery prospects also depend on the speed with which debt relief is achieved. A delayed resolution of the current unsustainable debt position would add uncertainty about future taxing policies and would thus depress spending in investment, harming the recovery prospects. This endogenous feedback effects from the timing of restructuring to Puerto Rico's performance have

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<sup>24</sup> It must be noted that a clause of lending into arrears or debtor in possession, while it would certainly benefit the debtor, would not necessarily benefit the existing creditors, who would face a trade-off: the size of the pie to be distributed among all creditors would increase, but their position in the line to get part of that pie would worsen, as they would become junior to the new creditors that lend into arrears.

not been incorporated into the model for projections used in the Fiscal Plan approved by the Board, but should be take into account in the debt policy decisions. We note that the inclusion of GNP linked bonds would also play a positive role for dealing with the uncertainty on the actual payment capacity of Puerto Rico.

Finally, we argued that debt restructuring will be a necessary but not a sufficient condition to drive Puerto Rico to a more dynamic and inclusive growth path. The debt restructuring must be accompanied by other productive policies. The Center for the New Economy is tackling this problem. In March 2017, it launched a Growth Commission that is studying how to restore the dynamism and inclusiveness of Puerto Rico's economy. The Commission is already working on identifying opportunities and innovative strategies to cope with the island's main structural problems with the goal of embarking on a superior path of long term growth.

The approach that is taken for resolving the crisis will affect the lives of hundreds of thousands of Puerto Rican families in the decades to come. The consequences of delaying a resolution to the crisis would be severe. An ineffective approach to deal with it would imply more social suffering for many; it would result in more vulnerability to health issues, more exclusion from the local labor markets, and lower possibilities for the youth for acquiring the education that the 21<sup>st</sup> century demands for a meaningful inclusion in the global market economy. A more persistent stagnation would also lead to more migration, which would not only take families apart, but would also leave an even larger burden on those who stay in the island. Such an outcome must be avoided. Our study presented a plan for effectively resolving the crisis and avoiding such a perverse social outcome. We hope our findings help those making decisions on behalf of the Puerto Ricans to have a more informed view of what the territory actually needs.

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